Tetrahedron: *Asymmetry* 22 (2011) 413–438

Contents lists available at ScienceDirect

Tetrahedron: *Asymmetry*

journal homepage: www.elsevier.com/locate/tetasy

Resolution of pentafluorophenyl 2-phenylpropanoate using combinations of *quasi*-enantiomeric oxazolidin-2-ones

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ARTICLE INFO

Article history:
Received 11 November 2010
Revised 17 February 2011
Accepted 24 February 2011
Available online 30 March 2011

ABSTRACT

The kinetic, mutual and parallel resolution of a series of structurally related active esters derived from 2-phenylpropanoic acid using a combination of *quasi*-enantiomeric oxazolidin-2-ones is discussed.

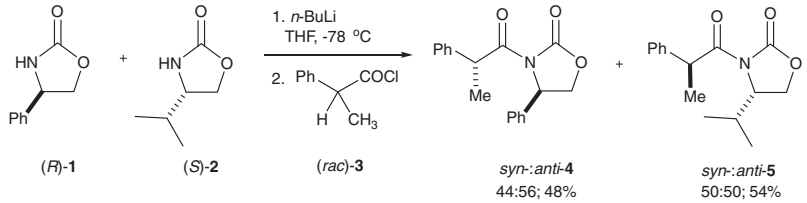
1. Introduction

The continuing development of novel synthetic methodologies for the efficient separation of enantiomers is important.[1] A strategy that has attracted considerable interest over the last decade has been the parallel separation of enantiomers using two complementary chiral auxiliaries.[2] The synthetic outcomes of this resolution strategy have been well documented by Davies[3] and Vedejs.[4] Since 2005, we have been interested in the applicability of this strategy for the parallel resolution of profens,[5] such as 2-phenylpropanoic acid, using an equimolar combination of *quasi*-enantiomeric[6] Evans oxazolidin-2-ones (Scheme 1).

We have shown[7] that deprotonation of an equimolar mixture of oxazolidin-2-ones (*R*)-**1** and (*S*)-**2** with *n*-BuLi in THF at −78 °C, followed by the addition of 2-phenylpropanoyl chloride (*rac*)-**3**, gave after 2 h at −78 °C, a separable diastereoisomeric mixture of oxazolidin-2-ones *syn*- and *anti*-**4** (ratio 44:56) and *anti*- and *syn*-**5** (ratio 50:50) in a combined 48% and 54% yields, respectively (Scheme 1). From this study,[7] it was evident that there was little molecular recognition between the oxazolidin-2-ones (*R*)-**1**/(*S*)-**2** and the enantiomers of 2-phenylpropanoyl chloride (*RS*)-**3** (Scheme 1). In an attempt to improve the levels of this molecular recognition between the oxazolidin-2-ones (*R*)-**1**/(*S*)-**2** and the 2-phenylpropanoyl chloride (*R*/*S*)-**3** [=(*rac*)-**3**], we chose to investigate the use of active esters[8] as surrogate acid chlorides, which were known to be less electrophilic and more sterically demanding than 2-phenylpropanoyl chloride (*rac*)-**3**. Herein we report our study into the use of racemic active esters, derived from 2-phenylpropanoic acid, as electrophilic acyl equivalents for the parallel kinetic resolution of 2-phenylpropanoic acid **6** using an equimolar combination of *quasi*-enantiomeric oxazolidin-2-ones, such as (*R*)-**1** and (*S*)-**2**.

2. Results and discussion

For this study, we were required to synthesise a series of active esters (*rac*)-**14–18** and anhydrides (*rac*)-**19–21** which contained a wide variety of traditional *pro*-leaving groups (Scheme 2). These active esters, (*rac*)-**14–18**, and anhydride (*rac*)-**19** were synthesised in moderate to high yield through DCC coupling of



Scheme 1. Parallel resolution of 2-phenylpropanoyl chloride (*rac*)-**3** using a *quasi*-enantiomeric combination of oxazolidin-2-ones (*R*)-**1** and (*S*)-**2**.

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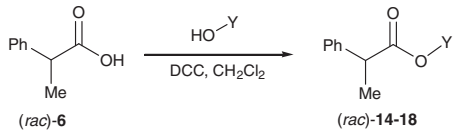
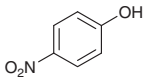
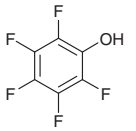
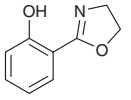
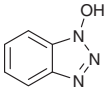
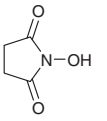
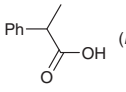
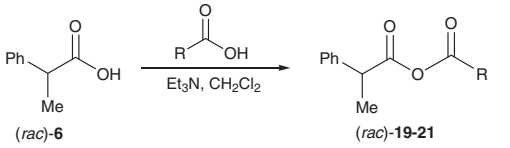
doi:10.1016/j.tetasy.2011.02.022

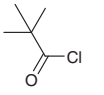
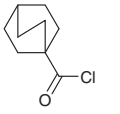


(*rac*)-**6** (*rac*)-**14-18**

Entry	*Pro*-leaving group		Active ester	Yield
1		**7**	(*rac*)-**14**	87%
2		**8**	(*rac*)-**15**	92%
3		**9**	(*rac*)-**16**	34%
4		**10**	(*rac*)-**17**	49%
5		**11**	(*rac*)-**18**	57%
6		(*rac*)-**6**	(*rac*)-**19**	64%



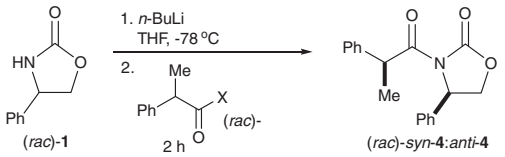
(*rac*)-**6** (*rac*)-**19-21**

7		**12**	(*rac*)-**20**[a]	—
8		**13**	(*rac*)-**21**[a]	—

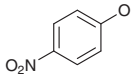
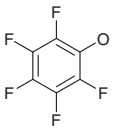
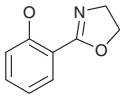
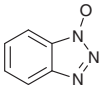
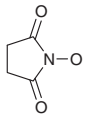
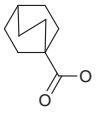
[a]Synthesised and used *in situ*

Scheme 2. Synthesis of active esters (*rac*)-**14–21**.

corresponding phenols **7–9**, 1-hydroxybenzotriazole **10**, *N*-hydroxy succinimide **11** and 2-phenylpropanoic acid (*rac*)-**6**, with 2-phenylpropanoic acid (*rac*)-**6** as shown in Scheme 2. The remaining mixed anhydrides (*rac*)-**20** and (*rac*)-**21** were formed in situ by the addition of 2-phenylpropanoic acid (*rac*)-**6** to a solution of pivaloyl chloride and adamantyl carbonyl chloride, respectively, with triethylamine in dichloromethane (Scheme 2).[9] With these



(*rac*)-**1** (*rac*)-*syn*-**4**:*anti*-**4**

Entry	X =	Active ester	*syn*-**4**:*anti*-**4**	Yield
1	Cl	(*rac*)-**3**	44:56	58%[6]
2		(*rac*)-**14**	87:13	68%
3		(*rac*)-**15**	97:3	70%
4		(*rac*)-**16**	90:10	35%
5		(*rac*)-**17**	76:24	42%
6		(*rac*)-**18**	84:16	40%
7		(*rac*)- and (*meso*)-**19** (1:1)	43:57	60%
8		(*rac*)-**20**	54:46	63%
9		(*rac*)-**21**	65:35	40%

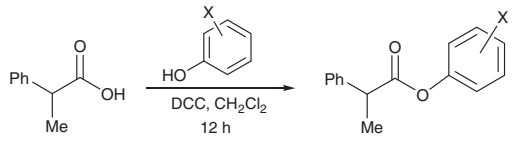
Scheme 3. Mutual kinetic resolution of active esters (*rac*)-**14–21** using oxazolidin-2-one (*rac*)-**1**.

active esters (*rac*)-**14–18** and anhydrides (*rac*)-**19–21** in hand, we next investigated their mutual kinetic resolution using 4-phenyloxazolidin-2-one (*rac*)-**1** (Scheme 3). The treatment of 4-phenyloxazolidin-2-one (*rac*)-**1** with *n*-BuLi in THF at −78 °C, followed by the addition of active esters (*rac*)-**14–18** and anhydrides (*rac*)-**19–21** gave, after 2 h at −78 °C, a separable diastereoisomeric mixture of oxazolidin-2-ones *syn*- and *anti*-**4** in moderate yield with poor to excellent levels of diastereocontrol (as determined by 400 MHz ^{1}H NMR spectroscopy)[10] (Scheme 3). In virtually all of the cases studied, the *syn*-oxazolidin-2-one **4** was the major diastereoisomer. Higher levels of diastereocontrol were obtained using active esters (*rac*)-**14–16** that contained a substituted phenol as the *pro*-leaving group [e.g., (*rac*)-**15** (94% de) > (*rac*)-**16**

(80% de) > **14** (74% de)] (Scheme 3: entries 2–4). In comparison, active esters, (*rac*)-**17** and (*rac*)-**18**, which contained 1-hydroxybenzotriazole (BtOH) **10** and *N*-hydroxy succinimide **11** as their *pro*-leaving group gave moderate to good levels of diastereoselectivity (Scheme 2: entries 3-5, and Scheme 3: entries 4–6). For the remaining the mixed anhydrides (*rac*)-**19–21**, these gave considerably lower levels of mutual recognition and diastereoselection than the phenol-derived active esters (*rac*)-**14**–**16** even though they had similar *pro*-leaving ability (Scheme 3: entries 7–9 vs entries 2–4).

With this information in hand, we next synthesised a wide range of structurally related active esters, (*rac*)-**53–83**, which contained a variety of mono-, di- and tri-substituted phenols **22**–**52** as *pro*-leaving groups in an attempt to study and improve the overall level of diastereoselectivity (Scheme 4).[11] The required active esters (*rac*)-**52–83** were synthesised in good yield by the addition of the corresponding phenol, **22**–**52**, to a solution of DCC and 2-phenylpropanoic acid (*rac*)-**6** in dichloromethane (Scheme 4).

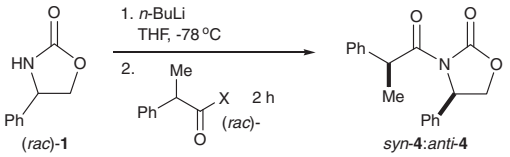
We next chose to screen these active esters, (*rac*)-**53–83**, using our benchmark lithitated oxazolidin-2-one (*rac*)-**1**-Li. The treatment of the oxazolidin-2-one (*rac*)-**1** with *n*-BuLi at −78 °C, followed by the addition of active esters (*rac*)-**53–83** in THF gave, after 2 h the corresponding oxazolidin-2-one *syn*- and *anti*-**4** with poor to excellent levels of diastereoselectivity (10% de→96% de) (Scheme 5). Under these reaction conditions, the more electrophilic active esters (*rac*)-**53–63**, **65–68**, **70–72**, (*rac*)-**74** and (*rac*)-**81**, that contained electron-withdrawing phenolic groups, gave the oxazolidin-2-one *syn*-**4** in moderate to high yield and with excellent levels of diastereoselectivity (66% de→96% de) (Scheme 5: entries 1–11, 13–16, 18–21, 23 and 30), whereas, the less electrophilic active esters, (*rac*)-**64**, (*rac*)-**75** and (*rac*)-**79**, which contained either a sterically demanding phenolic group or an electron-donating group gave the corresponding oxazolidin-2-one *syn*-**4** in 20% yield (with 38% de), in 8% yield (with 22% de) and 17% yield (with 26% de), respectively (Scheme 5: entries 12, 24 and 28). For the remaining active esters, (*rac*)-**69**, (*rac*)-**73**, (*rac*)-**76–78**, (*rac*)-**80** and (*rac*)-**82–83**, that contained electron-donating phenolic *pro*-leaving groups only gave the recovered starting materials as they were not electrophilic enough to allow nucleophilic addition of the lithiated oxazolidin-2-one (*rac*)-**1**-Li under these reaction conditions (Scheme 5: entries 17, 22, 25–27, 29 and 31–32). However, these addition reactions were found to proceed by allowing the reaction mixture to warm up from −78 °C to room temperature, and stirring the resulting solution for 12 h. These reactions gave the required oxazolidin-2-one **4** in moderate yield (25%→34%) but with a reversal of diastereoselection; the *anti*-diastereoisomeric adduct **4** was preferentially formed in moderate to good levels of diastereoselectivity (20% de→66% de). For the active ester (*rac*)-**75**, the formation of the *syn*-diastereoisomer **4** was preferred at low temperature (22% de; 8%), whereas, the *anti*-diastereoisomer was preferred at high temperature and longer reaction times (38% de; 21%) (Scheme 6: entry 4 vs Scheme 5: entry 24).



(*rac*)-**6** (*rac*)-**15** and **53-83**

Entry	Phenol		Active ester	Yield	Entry	Phenol		Active ester	Yield
1	2-FC_6H_4OH	**22**	(*rac*)-**53**	83%	17	C_6H_5OH	**38**	(*rac*)-**69**	76%
2	2-ClC_6H_4OH	**23**	(*rac*)-**54**	87%	18	C_6F_5OH	**8**	(*rac*)-**15**	92%
3	2-BrC_6H_4OH	**24**	(*rac*)-**55**	80%	19	C_6Cl_5OH	**39**	(*rac*)-**70**	30%
4	3-FC_6H_4OH	**25**	(*rac*)-**56**	72%	20	C_6H_5SH	**40**	(*rac*)-**71**	92%
5	3-ClC_6H_4OH	**26**	(*rac*)-**57**	61%	21	C_6F_5SH	**41**	(*rac*)-**72**	84%
6	4-FC_6H_4OH	**27**	(*rac*)-**58**	84%	22	4-MeC_6H_4OH	**42**	(*rac*)-**73**	80%
7	4-ClC_6H_4OH	**28**	(*rac*)-**59**	91%	23	4-MeC_6H_4SH	**43**	(*rac*)-**74**	69%
8	4-BrC_6H_4OH	**29**	(*rac*)-**60**	87%	24	2-EtC_6H_4OH	**44**	(*rac*)-**75**	53%
9	2,3-$Cl_2C_6H_3OH$	**30**	(*rac*)-**61**	65%	25	3-EtC_6H_4OH	**45**	(*rac*)-**76**	65%
10	2,4-$Cl_2C_6H_3OH$	**31**	(*rac*)-**62**	92%	26	4-EtC_6H_4OH	**46**	(*rac*)-**77**	57%
11	2,5-$Cl_2C_6H_3OH$	**32**	(*rac*)-**63**	87%	27	4-*i*-PrC_6H_4OH	**47**	(*rac*)-**78**	56%
12	2,6-$Cl_2C_6H_3OH$	**33**	(*rac*)-**64**	84%	28	2-$MeOC_6H_4OH$	**48**	(*rac*)-**79**	70%
13	3,4-$Cl_2C_6H_3OH$	**34**	(*rac*)-**65**	67%	29	4-$MeOC_6H_4OH$	**49**	(*rac*)-**80**	62%
14	3,5-$Cl_2C_6H_3OH$	**35**	(*rac*)-**66**	52%	30	4-PhC_6H_4OH	**50**	(*rac*)-**81**	64%
15	2,4,5-$Cl_3C_6H_3OH$	**36**	(*rac*)-**67**	86%	31	2,6-$Me_2C_6H_3OH$	**51**	(*rac*)-**82**	43%
16	2,4,6-$Cl_3C_6H_3OH$	**37**	(*rac*)-**68**	64%	32	2,6-Me_2(4-NO_2)C_6H_2OH	**52**	(*rac*)-**83**	49%

Scheme 4. Synthesis of active esters (*rac*)-**15** and (*rac*)-**53–83**.



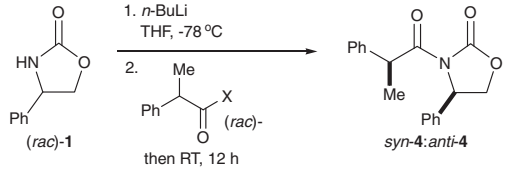
Entry	Active ester X =		syn-4:anti-4	Yield	Entry	Active ester X =		syn-4:anti-4	Yield
1	2-FC_6H_4O-	(*rac*)-**53**	95:5	39%	17	C_6H_5O-	(*rac*)-**69**	—	0%
2	2-ClC_6H_4O-	(*rac*)-**54**	98:2	36%	18	C_6F_5O-	(*rac*)-**15**	97:3	70%
3	2-BrC_6H_4O-	(*rac*)-**55**	96:4	30%	19	C_6Cl_5O-	(*rac*)-**70**	83:17	20%
4	3-FC_6H_4O-	(*rac*)-**56**	98:2	56%	20	C_6H_5S-	(*rac*)-**71**	95:5	21%
5	3-ClC_6H_4O-	(*rac*)-**57**	98:2	67%	21	C_6F_5S-	(*rac*)-**72**	95:5	37%
6	4-FC_6H_4O-	(*rac*)-**58**	95:5	39%	22	4-MeC_6H_4O-	(*rac*)-**73**	—	0%
7	4-ClC_6H_4O-	(*rac*)-**59**	95:5	39%	23	4-MeC_6H_4S-	(*rac*)-**74**	95:5	29%
8	4-BrC_6H_4O-	(*rac*)-**60**	95:5	34%	24	2-EtC_6H_4O-	(*rac*)-**75**	61:39	8%
9	2,3-$Cl_2C_6H_3O$-	(*rac*)-**61**	98:2	45%	25	3-EtC_6H_4O-	(*rac*)-**76**	—	0%
10	2,4-$Cl_2C_6H_3O$-	(*rac*)-**62**	98:2	49%	26	4-EtC_6H_4O-	(*rac*)-**77**	—	0%
11	2,5-$Cl_2C_6H_3O$-	(*rac*)-**63**	93:7	42%	27	4-*i*-PrC_6H_4O-	(*rac*)-**78**	—	0%
12	2,6-$Cl_2C_6H_3O$-	(*rac*)-**64**	69:31	20%	28	2-$MeOC_6H_4O$-	(*rac*)-**79**	63:37	17%
13	3,4-$Cl_2C_6H_3O$-	(*rac*)-**65**	98:2	29%	29	4-$MeOC_6H_4O$-	(*rac*)-**80**	—	0%
14	3,5-$Cl_2C_6H_3O$-	(*rac*)-**66**	86:14	32%	30	4-PhC_6H_4O-	(*rac*)-**81**	90:10	56%
15	2,4,5-$Cl_3C_6H_3O$-	(*rac*)-**67**	87:13	41%	31	2,6-$Me_2C_6H_3O$-	(*rac*)-**82**	—	0%
16	2,4,6-$Cl_3C_6H_3O$-	(*rac*)-**68**	55:45	20%	32	2,6-$Me_2(4\text{-}NO_2)C_6H_2OH$	(*rac*)-**83**	—	0%

Scheme 5. Mutual kinetic resolution of active esters (*rac*)-**15** and (*rac*)-**53–83** using oxazolidin-2-one (*rac*)-**1**.

In comparison, using the more reactive pentafluorophenyl 2-phenylpropanoate (*rac*)-**15**, under these reaction conditions gave similar levels of diastereoselectivity to that found at −78 °C (94% de at −78 °C/2 h vs 92% de at room temperature/12 h), however, the yield was lower (70% vs 62%). This is unsurprising as the addition process and formation of the oxazolidin-2-one **4** would have been completed within the initial 2 h at −78 °C. However, this oxazolidin-2-one product appears to be unstable under the reaction conditions for the remaining 10 h.[12] For the sterically demanding active ester (*rac*)-**82**, the formation of the oxazolidin-2-one **4** does not occur even under these prolonged reaction conditions (room temperature, 12 h), presumably illustrating the electron-donating nature of the 2,6-dimethylphenol *pro*-leaving group and additional steric congestion at both its *C*(2)- and *C*(6)-positions. Even for the more electronically activated 4-nitro-2,6-dimethylphenyl 2-propanoate (*rac*)-**83**, oxazolidin-2-one formation still does not occur as the methyl groups at both *C*(2)- and *C*(6)-positions of the phenol ring appear to disfavour nucleophilic addition to its carbonyl (C=O) group. Herein it appears there is an electronic and steric threshold associated with the phenolic *pro*-leaving group for efficient oxazolidin-2-one formation and diastereoisomeric control. For electron-donating phenols, such as phenol, with a pK_a >9.5, the formation of oxazolidin-2-one **4** appears to be slow at −78 °C, whereas, for electron-withdrawing phenols, such as pentafluorophenol, with a pK_a <9.5 this addition process is efficient, leading to the oxazolidin-2-one *syn*-**4** in 70% yield with a 94% de (Table 1). One of the more noteworthy differences in *pro*-leaving ability was between thiophenol (PhSH; pK_a 6.50) and phenol (PhOH; pK_a 9.95); the former leads to high levels of diastereoselection [giving (*rac*)-*syn*-**4** in 21% yield with >90% de], whereas, the latter was shown to be unreactive under these reaction conditions (Table 1: entry 3 vs entry 7, and Scheme 5: entry 20 vs entry 17).[13]

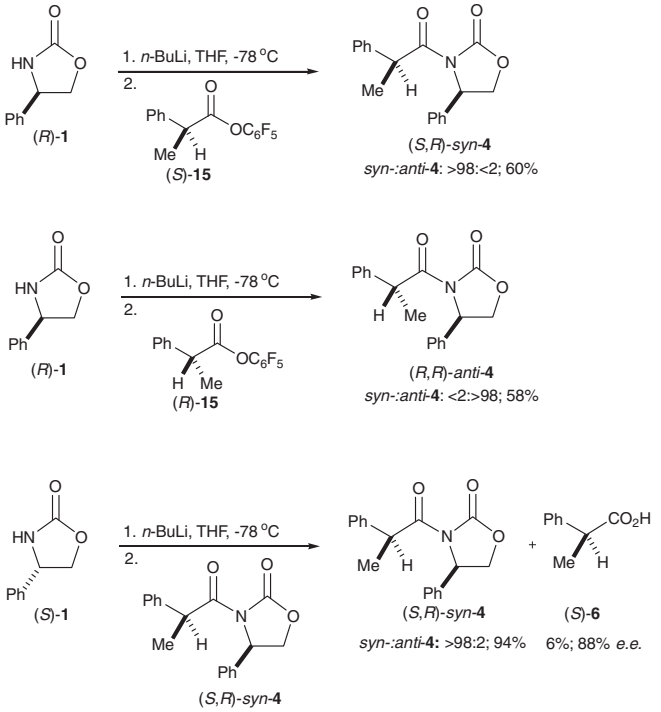
In an attempt to gain a better understanding of this mutual kinetic resolution, we next investigated the coupling of the enantiomerically pure oxazolidin-2-one (*R*)-**1** with both enantiomerically pure active esters (*S*)- and (*R*)-**15** (Scheme 7). Treatment of oxazolidin-2-one (*R*)-**1** with *n*-BuLi in THF at −78 °C, followed by the addition of the active ester (*S*)- and (*R*)-**15**, gave after 2 h, the corresponding enantiomerically pure oxazolidin-2-ones (*S*,*R*)-*syn*- and (*R*,*R*)-*anti*-**4** in 60% and 58% yields with >96% de, respectively. Under these conditions, the major diastereoisomer (*S*,*R*)-*syn*-**4** was found to be stable and was not epimerised in the presence of an additional equivalent of lithiated oxazolidin-2-one (*S*)-**1**; the original oxazolidin-2-one (*S*,*R*)-*syn*-**4** was re-isolated from the reaction mixture in 96% yield with 96% de (Scheme 7). However, a small amount of the enantiomerically enriched 2-phenylpropanoic acid (*S*)-**6** in 6% yield with 88% ee was also isolated[14] which was presumably formed by simple cleavage from the parent oxazolidin-2-one (*S*,*R*)-*syn*-**4** with trace amounts of lithium hydroxide (Scheme 7).

We next investigated the nature of the metal counter-ion on the levels of mutual recognition between the oxazolidin-2-one (*rac*)-**1**



Entry	Active ester X =		*syn*-**4**:*anti*-**4**	Yield
1	C_6F_5O-	(*rac*)-**15**	96:4	62%
2	C_6H_5O-	(*rac*)-**69**	40:60	21%
3	4-MeC_6H_4O-	(*rac*)-**73**	28:72	48%
4	2-EtC_6H_4O-	(*rac*)-**75**	31:69	21%
5	3-EtC_6H_4O-	(*rac*)-**76**	42:58	43%
6	4-EtC_6H_4O-	(*rac*)-**77**	18:82	34%
7	4-*i*-PrC_6H_4O-	(*rac*)-**78**	17:83	27%
8	2-$MeOC_6H_4O$-	(*rac*)-**79**	37:63	38%
9	4-$MeOC_6H_4O$-	(*rac*)-**80**	24:76	52%
10	2,6-$Me_2C_6H_3O$-	(*rac*)-**82**	—	—
11	2,6-Me_2(4-NO_2)C_6H_2O-	(*rac*)-**83**	—	—

Scheme 6. Mutual kinetic resolution of active esters (*rac*)-**15**, **69**, **73**, (*rac*)-**75–80** and **82–83** using oxazolidin-2-one (*rac*)-**1**.

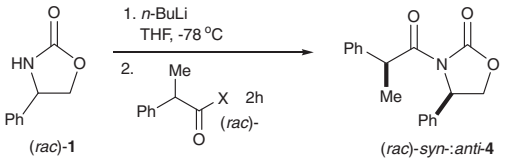


Scheme 7. Stereospecific synthesis of oxazolidin-2-one adducts (*S*,*R*)-*syn*- and (*R*,*R*)-*anti*-**4**.

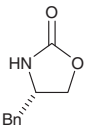
and the active ester (*rac*)-**15** (Scheme 8). We decided to deprotonate the parent oxazolidin-2-one (*rac*)-**1** with either *n*-BuLi or a variety of metal amides in the presence and absence of additives, such as crown ethers and HMPA, to see the effect, if any, of aggregation and/or co-ordination on the levels of diastereoselectivity. The use of a lithium counter-ion gave similarly high levels of diastereoselection (94% de) as a sodium counter ion (92% de) (Scheme 8: entries 6 and 8). The use of an organolithium or lithium/sodium amide as a Brønsted base appeared to have little to no effect on the stereochemical outcome of this reaction. In the case of lithium/sodium amide, the conjugate base, the parent amine, does not interfere with the stereochemical outcome of this process. By comparison, the less coordinating potassium counter-ion favoured formation of the *syn*-oxazolidin-2-one (*rac*)-*syn*-**4**, but with lower levels of diastereocontrol; Li^+ (94% de); Na^+ (92% de) and K^+ (68% de) (Scheme 8: entries 6, 8 and 10). In the presence of a suitable crown ether, the levels of diastereocontrol remained unchanged for lithium and sodium counter ions (Scheme 8: entries 4–9), with the exception of KHMDS, where the level of diastereoselectivity was reduced from 68% de to 52% de in the presence of 1 equiv of 18-crown-6 (Scheme 8: entries 10 and 11). Even in the presence of HMPA, the diastereocontrol was only lowered from 94% de to 82% de using a lithium counter ion (Scheme 8: entry 3). The use of a magnesium counter ion gave the required oxazolidin-2-one *syn*-**4** in low yield (<10%) with poor levels of diastereocontrol (60% de). Whether the reaction proceeds via a monomeric species or aggregate, the diastereoselective outcome appears to be the same. Some element of coordination is therefore important for excellent levels of diastereocontrol.

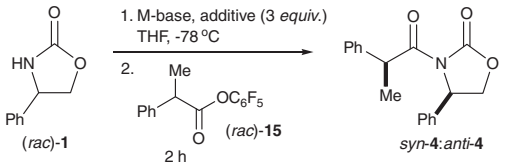
We next changed the reaction temperature, from −78 °C to +50 °C, to investigate the temperature dependence of this process. Deprotonation of the oxazolidin-2-one (*rac*)-**1** using *n*-BuLi in THF at the required temperature (−78 °C, −50 °C; 0 °C; +25 °C and

Table 1
Diastereoselectivity versus *pro*-leaving group



Entry	Active ester X=		*syn*-:*anti*-**4**	de (%)	pK_{HA} (H_2O)	
1	C_6F_5S–	(*rac*)-**72**	95:5	90	est 2–3	
2	C_6F_5O–	(*rac*)-**15**	97:3	>94	5.50	
3	C_6H_5S–	(*rac*)-**71**	95:5	90	6.50	
4	2,4-$Cl_2C_6H_3O$–	(*rac*)-**62**	98:2	>96	8.10	
5	4-FC_6H_4O–	(*rac*)-**58**	95:5	90	9.30	
6	4-PhC_6H_4O–	(*rac*)-**81**	90:10	80	9.51	
7	C_6H_5O–	(*rac*)-**69**	—	—	9.95	
8	4-$MeOC_6H_4O$–	(*rac*)-**80**	—	—	10.20	
9	4-MeC_6H_4O–	(*rac*)-**73**	—	—	10.26	





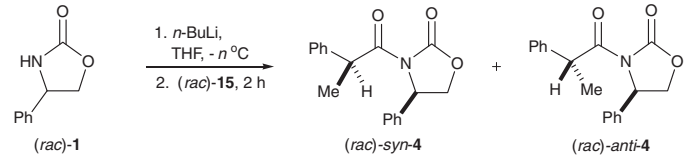
Entry	M-base	*syn*-**4**:*anti*-**4**	Yield
1	*n*-BuLi	97:3	70%
2	*n*-BuLi / 12-crown-4	97:3	59%
3	*n*-BuLi / HMPA	91:9	65%
4	LiN(*i*-Pr)$_2$	97:3	42%
5	LiN(*i*-Pr)$_2$ / 12-crown-4	97:3	65%
6	LiHMDS	96:4	56%
7	LiHMDS / 12-crown-4	97:3	63%
8	NaHMDS	96:4	57%
9	NaHMDS / 15-crown-5	97:3	76%
10	KHMDS	84:16	44%
11	KHMDS / 18-crown-6	76:24	77%
12	MeMgBr	80:20	<10%

Scheme 8. Diastereoselectivity versus metal counter-ion.

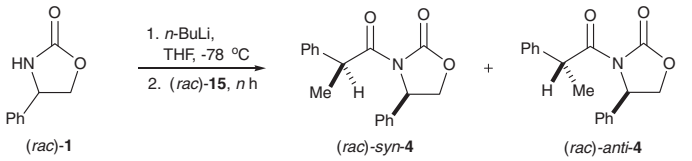
+50 °C), followed by the addition of the active ester (*rac*)-**15** and stirring the resulting solution at the same temperature for 2 h, gave the oxazolidin-2-one (*rac*)-*syn*-**4** in moderate to good yield (Scheme 9). The levels of diastereoselectivity were excellent (90–94% de) for the temperature range of −78 °C to +25 °C. However, increasing the temperature to +50 °C, gave the oxazolidin-2-one (*rac*)-*syn*-**4** in a reduced 45% yield with 60% de. Interestingly, there appears to be a temperature threshold between +25 °C and +50 °C where the stereochemical outcome is lowered from 90% de to 60% de. The formation and isolation of the oxazolidin-2-one adduct (*rac*)-*syn*-**4** appears to be more favoured for lower temperature reactions; the yield was reduced from 70% to 45% when the temperature was raised from −78 °C to +50 °C (Scheme 9). The diastereoselectivity of this mutual kinetic resolution remained unchanged even when this reaction time was lowered to 5 min; the oxazolidin-2-one adduct *syn*-**4** was formed in a reduced 38% yield with 92% de (Scheme 9).

We next probed the effect of temperature on the kinetic resolution of this active ester (*rac*)-**15** using the enantiomerically pure oxazolidin-2-one (*S*)-**1** (Scheme 10). The treatment of oxazolidin-2-one (*S*)-**1** with *n*-BuLi in THF at −78 °C, followed by the addition of 1 equiv of active ester (*rac*)-**15** in THF, and quenching the reaction after 5 min, 10 min, 20 min and 2 h gave, the oxazolidin-2-one adduct (*rac*)-*syn*-**4** in 30%→39% yield, with 94%→44% de. The levels of diastereocontrol were found to be excellent (94% de) for short reaction times (5 min). With increased reaction times, the levels of diastereocontrol were reduced from 94% de to 44% de due to the increased likelihood of the lithiated (*S*)-oxazolidin-2-one **1** adding to the less reactive enantiomer of (*S*)-**15** to give the minor diastereoisomeric oxazolidin-2-one (*S*,*S*)-*anti*-**4**. Using an excess of this active ester (*rac*)-**15** (2 equiv), this limited the formation of the unwanted oxazolidin-2-one (*S*,*S*)-*anti*-**4** by ensuring that the oxazolidin-2-one (*S*)-**1** had an additional equivalent of the more reactive (*R*)-**15** to form the preferred adduct (*R*,*S*)-*syn*-**4** (Scheme 10). The same diastereoisomeric outcome can also be obtained using a shorter reaction time (5 min) even in the presence of a substoichiometric amount of active ester (*rac*)-**15** (0.25 equiv); the diastereoselectivity remained constant (94% de) from 2 equiv→ 0.25 equiv of active ester (*rac*)-**15** (Scheme 10).

In an attempt to probe the reaction rates, we next investigated a double mutual kinetic resolution of oxazolidin-2-one (*rac*)-**1** using two racemic active esters (*rac*)-**15** and (*rac*)-**84** (Scheme 11). Deprotonation of oxazolidin-2-one (*rac*)-**1** with *n*-BuLi in THF at −78 °C, followed by the addition of an equimolar amount of active esters (*rac*)-**15** and (*rac*)-**84** gave, after 2 h at −78 °C, an inseparable mixture of oxazolidin-2-ones (*rac*)-*syn*-**4** and (*rac*)-*syn*-**85** (ratio 89:11) in 40% yield with a combined 94% de (Scheme 11). To ensure this chemoselectivity was not dependent on the active

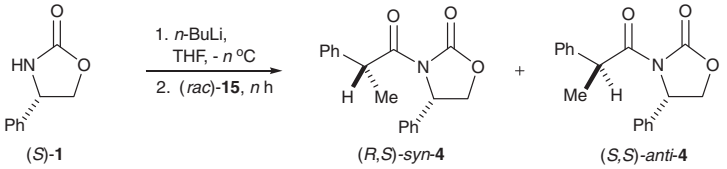


syn-**4**:*anti*-**4**	97:3 (70 %)	96:4 (61 %)	96:4 (62 %)	95:5 (53 %)	80:20 (45%)
Temperature	-78°C	-50°C	0°C	+25°C	+50°C

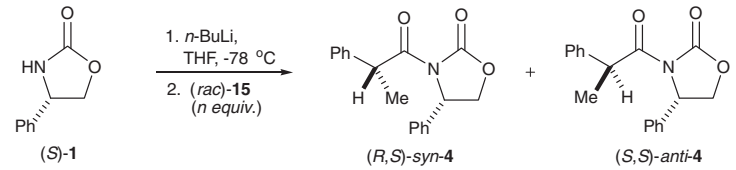


Time	5 min	2 h
syn-**4**:*anti*-**4**	96:4 (38 %)	97:3 (70 %)
recovered (*rac*)-**15**	37 %	12 %

Scheme 9. Diastereoselectivity versus temperature and reaction time.



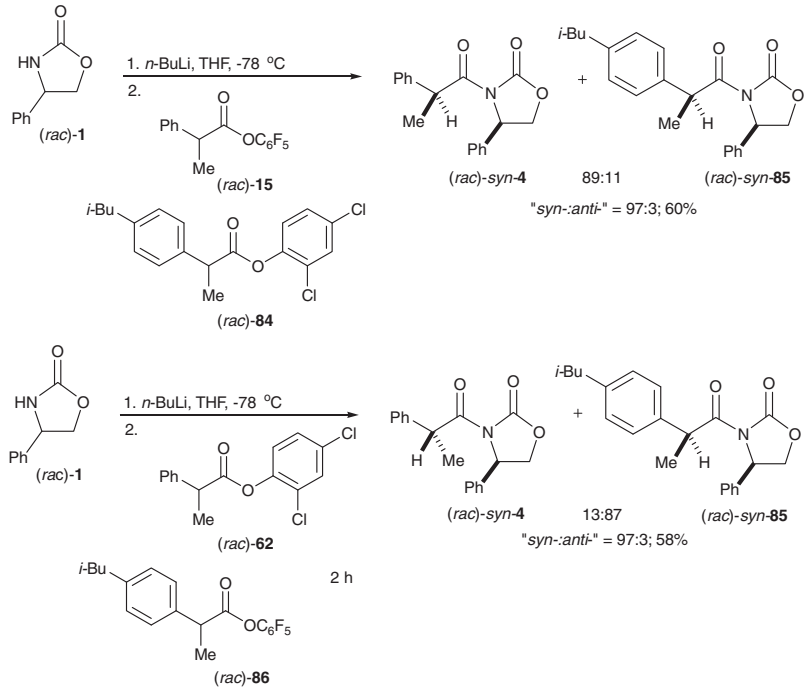
syn-**4**:*anti*-**4**	97:3 (39 %)	93:7 (34 %)	86:14 (30 %)	72:28 (34 %)
Time	5 min	10 min	20 min	2 h



5 min	*syn*-**4**:*anti*-**4**	97:3 (57 %)	97:3 (39 %)[a]	97:3 (7 %)	97:3 (3%)
	(*rac*)-**15** *n* equiv.	2 *equiv.*	1 *equiv.*	0.5 *equiv.*	0.25 *equiv.*
2 h	*syn*-**4**:*anti*-**4**	94:6 (61 %)	72:28 (34 %)	——	——
	(*rac*)-**15** *n* equiv.	2 *equiv.*	1 *equiv.*	——	——

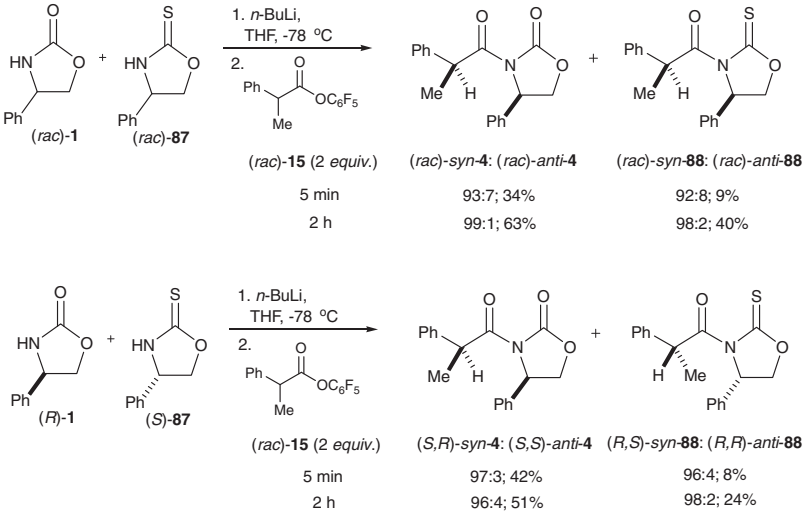
[a]active ester (*S*)-**15** was isolated in 37 % yield with 44 % e.e.

Scheme 10. Kinetic resolution of active ester (*rac*)-**15** using the oxazolidin-2-one (*S*)-**1**.



Scheme 11. Mutual kinetic resolution of oxazolidin-2-one (*rac*)-**1** using active esters (*rac*)-**15**/**84** and (*rac*)-**62**/**86**.

esters themselves, we repeated this resolution using the complementary active esters (*rac*)-**62** and (*rac*)-**86** (Scheme 11). Under our standard reaction conditions, these active esters (*rac*)-**62** and (*rac*)-**86**, gave the reversed combination of oxazolidin-2-ones (*rac*)-*syn*-**4** and (*rac*)-*syn*-**85** (ratio 13:87) in 58% yield with a combined 94% de (Scheme 11). Evidently, the formation of the oxazolidin-2-one adducts **4** by addition of oxazolidin-2-one **1** to a pentafluorophenyl ester [either (*rac*)-**15** or (*rac*)-**86**] was at least one order of magnitude faster than that of a related 2,4-dichlorophenyl ester [either (*rac*)-**62** or (*rac*)-**84**] (Scheme 11).

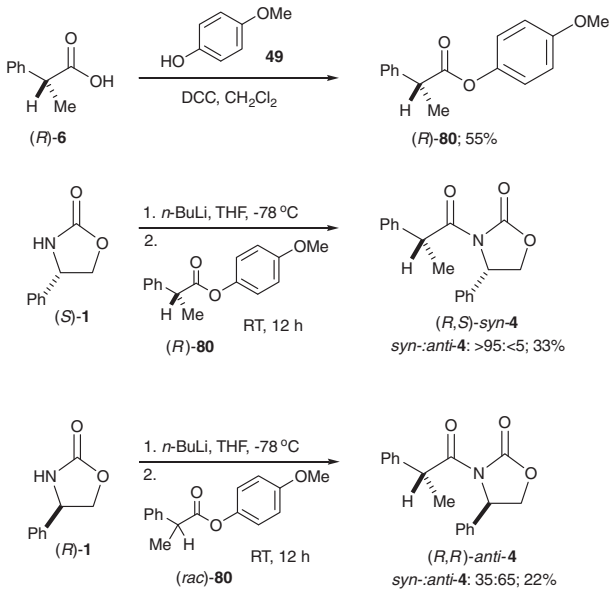


Scheme 12. Parallel and mutual kinetic resolution of active ester (*rac*)-**15** using oxazolidin-2-(thi)ones **1** and **87**.

We have also investigated the complementary double mutual kinetic resolution of active ester (*rac*)-**15** using the oxazolidin-2-one (*rac*)-**1** and oxazolidin-2-thione (*rac*)-**87**[15] (Scheme 12). The lithiated oxazolidin-2-one (*rac*)-**1** was found to react at least four times faster than the lithiated oxazolidin-2-thione (*rac*)-**87** presumably due to it being less stable and a higher energy conjugate base. The levels of diastereocontrol appear to be similar to those of their individual mutual kinetic resolutions. However, for a shorter reaction time (5 min), the levels of diastereoselectivity were lowered from 98% de to 86% de for (*rac*)-*syn*-**4**, and from 96% de to 84% de (Scheme 12).

The parallel resolution of racemic pentafluorophenyl 2-phenylpropanoate (*rac*)-**15** can be achieved by two simultaneous kinetic resolutions involving the oxazolidin-2-one (*R*)-**1** and its complementary *quasi*-enantiomeric oxazolidin-2-thione (*S*)-**87** (Scheme 12). Treatment of oxazolidin-2-one (*R*)-**1** and oxazolidin-2-thione (*S*)-**87** in THF at −78 °C with *n*-BuLi (2 equiv), followed by the addition of the active ester (*rac*)-**15** in THF, gave after 2 h the oxazolidin-2-one (*S*,*R*)-*syn*-**4** as the major product in 51% yield with 92% de and the oxazolidin-2-thione (*R*,*S*)-*syn*-**88** as the minor product in 24% yield in 96% de (Scheme 12). The level of diastereocontrol remained unchanged, even when this reaction was stopped after 5 min.

In an attempt to gain a better understanding on whether epimerisation or racemisation occurred during these addition processes; we decided to investigate the stereospecific formation of the oxazolidin-2-one adduct (*R*,*S*)-*syn*-**4** using an enantiomerically pure active ester (*R*)-**80** that had low electrophilicity (Scheme 13). This enantiomerically pure active ester (*R*)-**80** was synthesised in 55% yield by the addition of DCC to a solution of enantiomerically pure carboxylic acid (*R*)-**6** and 4-methoxyphenol **49** in dichloromethane (Scheme 13). Treatment of the lithiated oxazolidin-2-one (*rac*)-**1**-Li in THF at −78 °C with a solution of this active ester (*R*)-**80** in THF, and stirring the resulting solution at room temperature for 12 h gave the enantiomerically pure oxazolidin-2-one (*R*,*S*)-*syn*-**4** in 33% yield with >90% de. Under these reaction conditions little or no epimerisation of the product oxazolidin-2-one (*R*,*S*)-*syn*-**4** nor racemisation of the active ester (*R*)-**80** occurred (Scheme 13). Under identical conditions, the kinetic resolution of the racemic active ester (*rac*)-**80** using an enantiomerically pure oxazolidin-2-one (*R*)-**1** gave the *anti*-diastereoisomeric oxazolidin-2-one (*R*,*R*)-*anti*-**4** in 21% yield with 16% de (Scheme 13). Under these conditions, it appears that formation of the *anti*-diastereoisomer, (*R*,*R*)-*anti*-**4**, does not occur via epimerisation of the faster forming *syn*-diastereoisomer.



Scheme 13. Stereospecific synthesis of oxazolidin-2-one adducts (*S*,*R*)-*syn*-**4**.

As the stereoselectivity of this resolution is independent of the concentration of the active ester **15** (up to ~39% conversion—Scheme 10); there must be an element of reversibility (reversion) within this reaction to allow for the (*R*)- and (*S*)-enantiomers of the active ester **15** to be interchanged. From our results, it seems that this resolution proceeds via an addition–elimination mechanism.

We calculated the total energies of 4-phenyloxazolidin-2-one **1**, pentafluorophenyl 2-phenylpropanoate **15** and the corresponding products *syn*-(*R*,*S*)- and *anti*-(*S*,*S*)-**4** (Table 2), the lithiated 4-phenyloxazolidin-2-ones Li-**1** (**A** and **B**) (Table 3) and intermediates, **W**–**Z**, (Table 4) using dispersion-corrected density functional theory (RI-TPSS-D/def2-TZVP) to obtain the potential energy pathway (Fig. 1).

Deprotonation of 4-phenyloxazolidin-2-one **1** with *n*-BuLi appears to favour the formation of the more stable N-lithiated 4-phenyloxazolidin-2-one, **B** (+**15**) rather than the O-lithiated

Table 2
Minimised structures of oxazolidin-2-one (*S*)-**1**, pentafluorophenyl 2-phenylpropanoate (*R*)-**15**, and oxazolidin-2-one adducts *syn*-(*R*,*S*)-**4** and *anti*-(*S*,*S*)-**4** obtained at the RI-TPSS-D/def2-TZVP level of theory

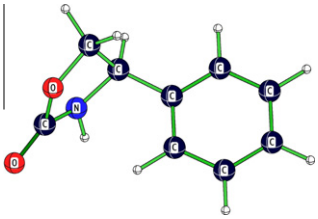
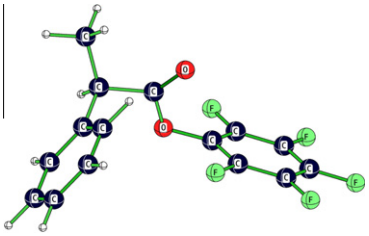
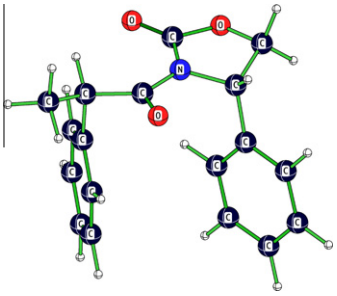
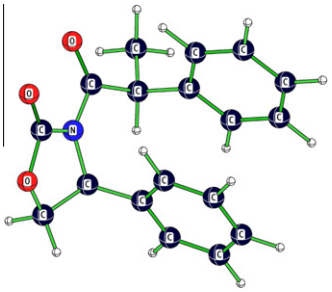
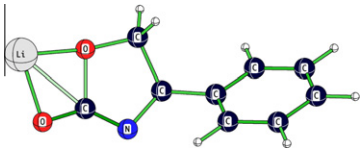
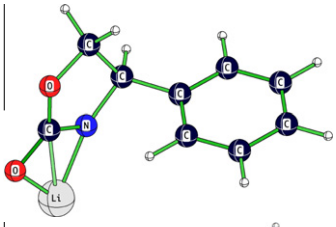
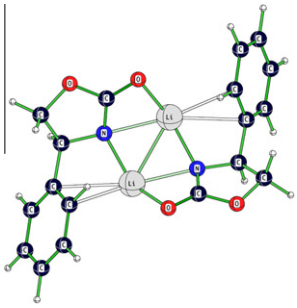
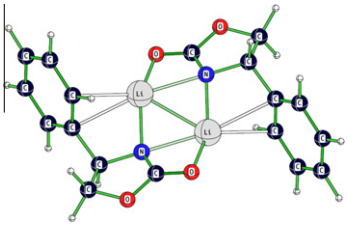
Compound	Structure	Compound	Structure
1		**15**	
syn-(*R*,*S*)-**4**		*anti*-(*S*,*S*)-**4**	

Table 3
Minimised structures of lithiated oxazolidin-2-ones **A**, **B**, dimers (*S*,*S*)-**D** and (*R*,*S*)-**E** obtained at the RI-TPSSD/def2-TZVP level of theory

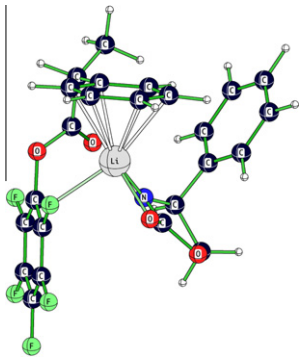
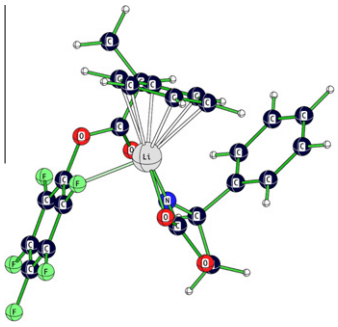
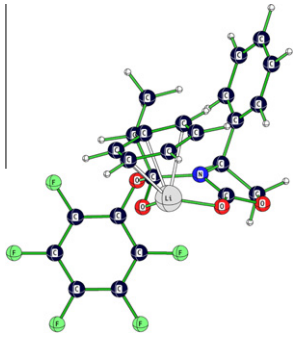
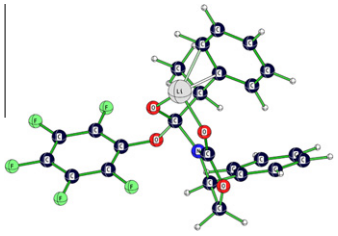
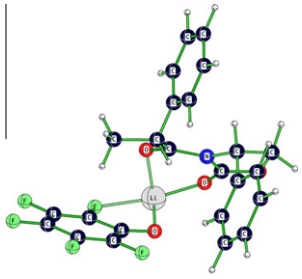
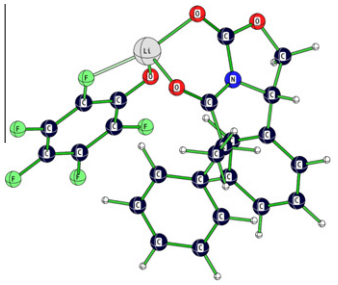
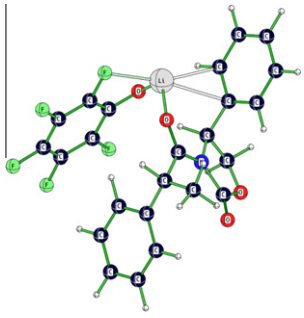
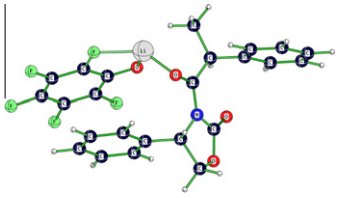
Compound	Structure	Compound	Structure
A		**B**	
Dimer (*S*,*S*)-**D**		Dimer (*R*,*S*)-**E**	

4-phenyloxazolidin-2-one **A** (+**15**) by 36 kJ mol^{-1} (Fig. 1). However, this N-lithiated 4-phenyloxazolidin-2-one can be further stabilised by −123 kJ mol^{-1} in **C** (**+15**) by additional and co-operative co-ordination[16] via either dimer (*S*,*S*)-**D** or dimer (*R*,*S*)-**E** formation[17] (Fig. 1 and Table 3).

Further stabilisation of this lithiated oxazolidin-2-one can be achieved through aggregation with the active ester, pentafluorophenyl 2-phenylpropanoate **15**, to give the aggregates *syn*-(*R*,*S*)- and *anti*-(*S*,*S*)-**W** (Table 4); the *syn*-aggregate (*R*,*S*)-**W** is preferred over the *anti*-aggregate (*S*,*S*)-**W** by 5 kJ mol^{-1} (Fig. 1). In both aggregates, the lithium atom is co-ordinated to the pentafluorophenyl 2-phenylpropanoate (*S*/*R*)-**15** [by its 2-fluoro-substituent within the C_6F_5-ring and *C*(2)-phenyl group], and the oxazolidin-2-one (*S*)-**1** (by its O/N atoms) as shown in Figure 1. The only subtle difference between these two complexes, (*R*,*S*)-**W** and (*S*,*S*)-**W**, is the relative position of the methyl group within the active ester **15** (see Table 4).

The addition of the N-lithiated oxazolidin-2-one Li-**1** (in **B**) to the carbonyl (C=O) group of the active ester **15** leads to the two diastereoisomeric tetrahedral intermediates *syn*-(*R*,*S*)-**X** and *anti*-(*S*,*S*)-**X** (Fig. 1). The more stable being the *anti*-(*S*,*S*)-diastereoisomer **X** by 8 kJ mol^{-1}. The relative energy difference between the *syn*-(*R*,*S*)-intermediates, **W**–**X**, was smaller (+3 kJ mol^{-1}) than the corresponding difference between *anti*-(*S*,*S*)- intermediates, **W**–**Y** (−10 kJ mol^{-1}). In both intermediates, *syn*-(*R*,*S*)- and *anti*-(*S*,*S*)-**X**, the phenyl group of the oxazolidin-2-one **1** is positioned *anti*- to the pentafluorophenyl group of the active ester **15**, and additional co-ordination comes from the Ph group of this active ester, and the carbonyl (C=O) group of the parent oxazolidin-2-one **1** (Fig. 1 and Table 2).

Table 4
Minimised structures for aggregates **W** and intermediates **X**–**Z** obtained at the RI-TPSS-D/def2-TZVP level of theory

Compound	Structure	Compound	Structure
syn-(*R*,*S*)-**W**		*anti*-(*S*,*S*)-**W**	
syn-(*R*,*S*)-**X**		*anti*-(*S*,*S*)-**X**	
syn-(*R*,*S*)-**Y**		*anti*-(*S*,*S*)-**Y**	
syn-(*R*,*S*)-**Z**		*anti*-(*S*,*S*)-**Z**	

The reformation of the carbonyl (C=O) groups, in *syn*-(*R*,*S*)-**Y** and *anti*-(*S*,*S*)-**Y**, by elimination of lithium pentafluorophenolate (C_6F_5OLi), from *syn*-(*R*,*S*)-**X** and *anti*-(*S*,*S*)-**X**, further increases the stabilisation by -80 kJ mol^{-1} [for *syn*-(*R*,*S*)-**Y**] and -77 kJ mol^{-1} [for *anti*-(*S*,*S*)-**Y**] (Fig. 1). The lithium pentafluorophenolate is also stabilised by co-ordinating to both carbonyl (C=O) groups within the products *syn*-(*R*,*S*)- and *anti*-(*S*,*S*)-**Y**. Removing this co-ordination, increases the relative energy of these intermediates; *syn*-(*R*,*S*)-**Y**→*syn*-(*R*,*S*)-**Z** (+31 kJ mol^{-1})→*syn*-(*R*,*S*)-**4** + C_6F_5OLi (+126 kJ mol^{-1}) and *anti*-(*S*,*S*)-**Y**→*anti*-(*S*,*S*)-**Z** (+35 kJ mol^{-1})→*anti*-(*S*,*S*)-**4** + C_6F_5OLi (+153 kJ mol^{-1}) (Fig. 1). The major diastereoisomeric product of this resolution, oxazoldin-2-one *syn*-(*R*,*S*)-**4**, appears to be more thermodynamically stable (-26 kJ mol^{-1}) than the minor diastereoisomer *anti*-(*S*,*S*)-**4**, and is significantly more stable (-32 kJ mol^{-1}) than the starting precursors (*S*)-**1** and (*S*/*R*)-**15**.

The major product of this resolution is the more stable *syn*-diastereoisomeric oxazolidin-2-one *syn*-(*R*,*S*)-**4**, and as there is element of reversibility in its formation, the *syn*-aggregate (*R*,*S*)-**W** [rather than *anti*-aggregate (*S*,*S*)-**W**] appears to be a governing factor in this outcome (Fig. 1). There appears to be little potential energy difference (+3 kJ mol^{-1}) between the initial tetrahedral intermediate *syn*-(*R*,*S*)-**X** and its *syn*-aggregate (*R*,*S*)-**W**. The formation of the diastereoisomeric intermediate, *anti*-(*S*,*S*)-**X**, can be disfavoured by promoting either the addition process via the more populated *syn*-aggregate (*R*,*S*)-**W** or by reversion back to the parent *anti*-aggregate (*S*,*S*)-**W** and subsequent enantiomeric interchange via **C** (+**15**) as the forward reaction to give *anti*-(*S*,*S*)-**Y** is presumably slower.

With this preliminary study complete, we next probed the structural nature of the oxazolidin-2-ones (*rac*)-**2** and (*rac*)-**89**–

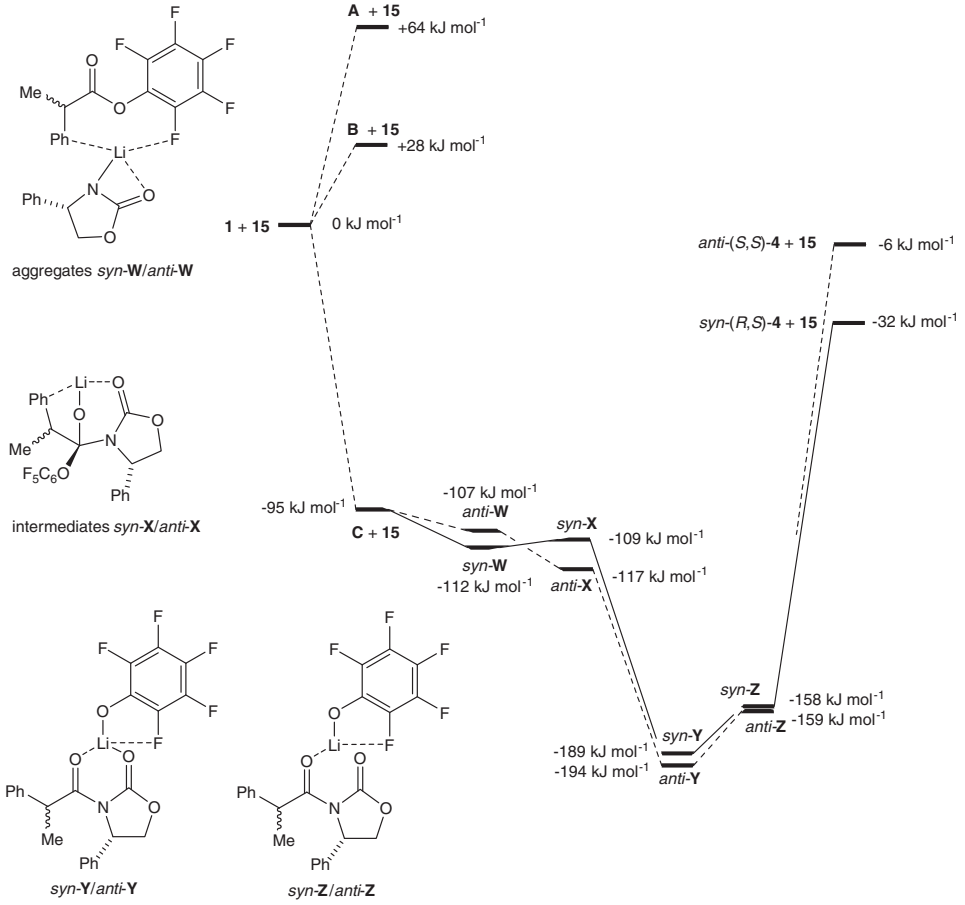
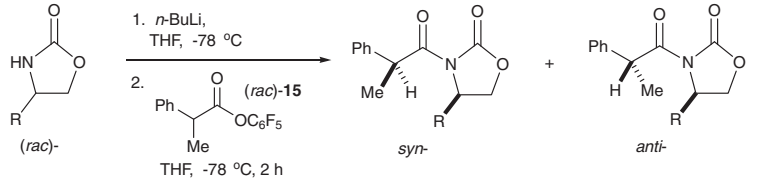


Figure 1. Potential energy profile for the resolution of oxazolidin-2-one (*S*)-**1** and pentafluorophenyl 2-phenylpropanoate (*R*)- and (*S*)-**15**. Potential energy values in kJ mol^{-1} relative to **1**+**15,** computed at the RI-TPSS-D/def2-TZVP level of theory.



Entry	1	2	3	4	5
Oxazolidinone	(*rac*)-**89**	(*rac*)-**90**	(*rac*)-**1**	(*rac*)-**2**	(*rac*)-**91**
Adduct (*rac*)-	*syn*,*syn*-**92**:*anti*,*syn*-**92**	*syn*-**93**:*anti*-**93**	*syn*-**4**:*anti*-**4**	*syn*-**5**:*anti*-**5**	*syn*-**94**:*anti*-**94**
	68:32	70:30	97:3	95:5	95:5
Yield	63%	71%	70%	58%	63%

Scheme 14. Mutual kinetic resolution of oxazolidin-2-ones (*rac*)-**1**, (*rac*)-**2** and (*rac*)-**89–91** using active esters (*rac*)-**15**.

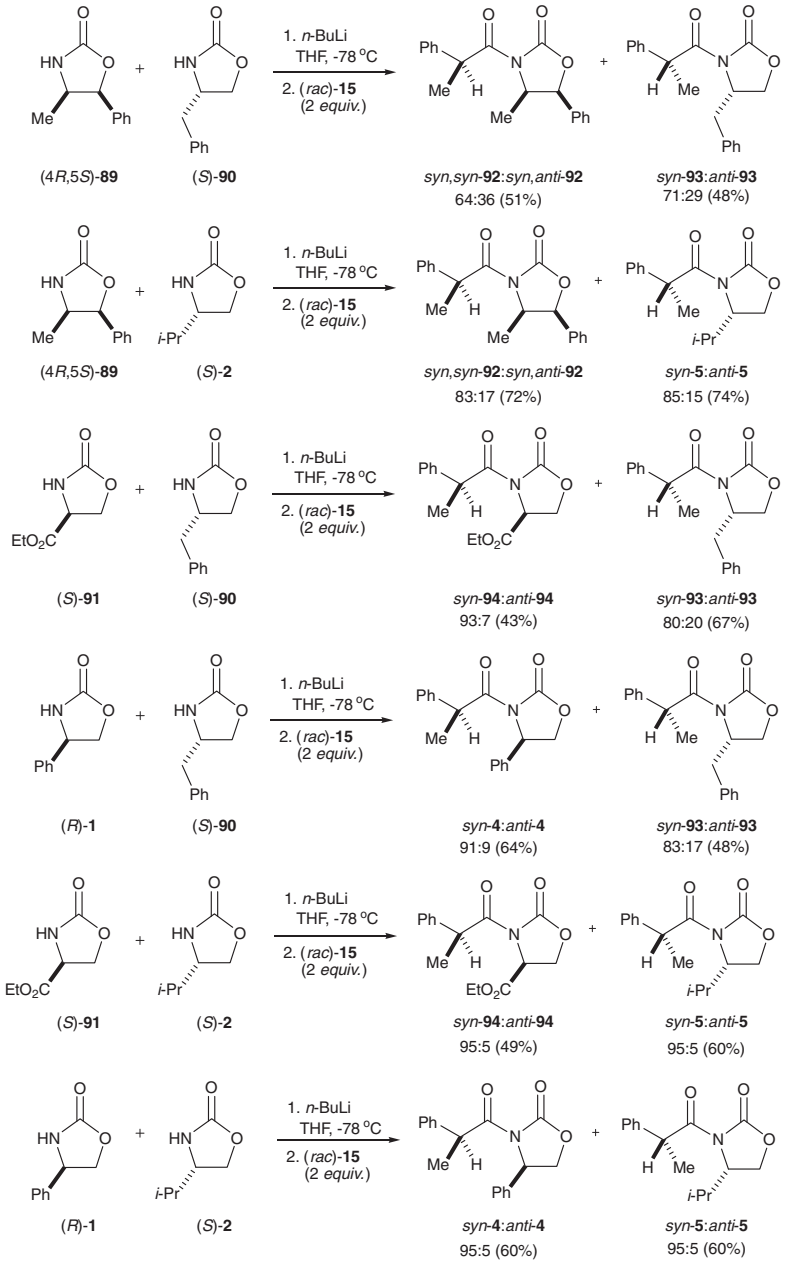
91 in an attempt to gain a better understanding of the origin of this diastereoselection (Scheme 14). Herein, we chose to use a series of structurally related oxazolidin-2-ones, (*rac*)-**89**, (*rac*)-**90**, (*rac*)-**2** and (*rac*)-**91** derived from norephedrine, phenylalanine, valine and serine, respectively (Scheme 14). We first investigated the mutual kinetic resolution of pentafluorophenyl 2-phenylpropanoate (*rac*)-**15** using these lithiated oxazolidin-2-ones. Deprotonation of the oxazolidin-2-ones (*rac*)-**89**, (*rac*)-**90**, (*rac*)-**2** and (*rac*)-**91** with

n-BuLi in THF at −78 °C, followed by the addition of pentafluorophenyl 2-phenylpropanoate (*rac*)-**15** gave, after 2 h at −78 °C a separable diastereoisomeric mixture of oxazolidin-2-one adducts (*rac*)-*syn*,*syn*- and (*rac*)-*syn*,*anti*-**92**, (*rac*)-*syn*- and (*rac*)-*anti*-**93**, (*rac*)-*syn*- and (*rac*)-*anti*-**5**, and (*rac*)-*syn*- and (*rac*)-*anti*-**94** in good yield (Scheme 14).

The levels of diastereoselection were excellent (>90% de) for the oxazolidin-2-ones (*rac*)-**2** and (*rac*)-**91** (Scheme 14: entries 4 and 5) and more importantly comparable to those of 4-phenyloxazolidin-2-one (*rac*)-**1** (Scheme 14). The oxazolidin-2-ones, (*rac*)-**89** and (*rac*)-**90**, which contained a less sterically demanding alkyl substituent at their *C*(4)-positions gave the corresponding oxazolidin-2-one adducts (*rac*)-*syn*,*syn*-**92** and (*rac*)-*syn*-**93** in good yield with lower levels of diastereocontrol, 36% and 40% de, respectively (Scheme 14: entries 1 and 2).

With this information in hand, we next chose to investigate the resolution of pentafluorophenyl 2-phenylpropanoate (*rac*)-**15** using six combinations of *quasi*-enantiomeric oxazolidin-2-ones, such as (4*R*,5*S*)-**89** and (*S*)-**90**, (4*R*,5*S*)-**89** and (*S*)-**2**, (*S*)-**91** and (*S*)-**90**, (*R*)-**1** and (*S*)-**90**, (*S*)-**91** and (*S*)-**2**, and (*R*)-**1** and (*S*)-**2** (Scheme 15).

The treatment of these equimolar combinations of *quasi*-enantiomeric oxazolidin-2-ones (4*R*,5*S*)-**89** and (*S*)-**90**, (4*R*,5*S*)-**89** and (*S*)-**2**, (*S*)-**91** and (*S*)-**90**, (*R*)-**1** and (*S*)-**90**, (*S*)-**91** and (*S*)-**2**, and (*R*)-**1** and (*S*)-**2** with *n*-BuLi in THF at −78 °C, followed by the addition of pentafluorophenyl 2-phenylpropanoate (*rac*)-**15** gave, after 2 h at −78 °C, a diastereoisomeric mixture of oxazolidin-2-ones *syn*,*syn*- and *syn*,*anti*-**92** (ratio 64:36; 51%) and *syn*- and *anti*-**93** (ratio 71:29; 48%), *syn*,*syn*- and *syn*,*anti*-**92** (ratio 83:17; 72%) and *syn*- and *anti*-**5** (ratio 85:15; 74%), *syn*- and *anti*-**94** (ratio 93:7; 43%) and *syn*- and *anti*-**93** (ratio 80:20; 67%), *syn*- and *anti*-**4** (ratio 91:9; 64%) and *syn*- and *anti*-**93** (ratio 83:17; 48%), *syn*- and *anti*-**94** (ratio 95:5; 49%) and *syn*- and *anti*-**5** (ratio 95:5; 60%), and *syn*- and *anti*-**4** (ratio 95:5; 60%) and *syn*- and *anti*-**5** (ratio 95:5; 60%) (Scheme 15).



Scheme 15. Parallel kinetic resolution of active ester (*rac*)-**15** using oxazolidin-2-ones (*R*)-**1**, (*S*)-**2**, (4*S*,5*R*)-**89**, (*S*)-**90** and (*S*)-**91**.

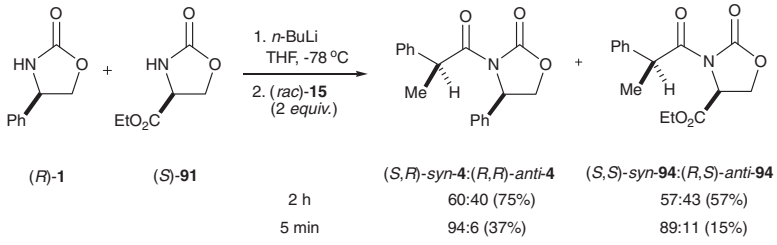
The levels of diastereocontrol were found to be excellent for oxazolidin-2-ones (*R*)-**1**, (*S*)-**2** and (*S*)-**91** and comparable to the high levels of diastereoselectivity that were obtained for their mutual kinetic resolutions (Scheme 13). For combinations of these *quasi*-enantiomeric oxazolidin-2-ones, such as (*S*)-**91** and (*S*)-**2**, and (*R*)-**1** and (*S*)-**2**, the overall level of molecular recognition was excellent leading to two separable diastereoisomeric combination of adducts *syn*-**94** and *syn*-**5**, and *syn*-**4** and *syn*-**5**, respectively (Scheme 15). For combinations involving one of these oxazolidin-2-ones (*R*)-**1**, (*S*)-**2** and (*S*)-**91** and a less stereoselective oxazolidin-2-one partner (4*R*,5*S*)-**89** and (*S*)-**90** [e.g., (4*R*,5*S*)-**89** and (*S*)-**2**, (*S*)-**91** and (*S*)-**90**, and (*R*)-**1** and (*S*)-**90**], the levels of diastereocontrol were lowered for the oxazolidin-2-one adducts **4**, **5** and **94** derived from (*R*)-**1**, (*S*)-**2** and (*S*)-**91**, but were higher for those oxazolidin-2-one adducts **92** and **93** derived from the less stereoselective complementary oxazolidin-2-ones (4*R*,5*S*)-**89** and (*S*)-**90** (Scheme 15). For resolutions involving two moderately stereoselective oxazolidin-2-ones, such as (4*R*,5*S*)-**89** and (*S*)-**90**, the corresponding oxazolidin-2-one adducts *syn*,*syn*- and *syn*,*anti*-**92**, and *syn*- and *anti*-**93**, was obtained, respectively with similar levels of stereocontrol to those obtained from their mutual kinetic resolutions (Schemes 14 and 15).

In an attempt to determine the complementarity of these oxazolidin-2-ones **1** and **91** and their relative rate of oxazolidin-2-one formation, we next investigated the competitive addition of a pair of oxazolidin-2-ones (*R*)-**1** and (*S*)-**91**, which contained the same sense of reagent control to our standard substrate pentafluorophenyl 2-phenylpropanoate (*rac*)-**15** (Scheme 16). Deprotonation of an equimolar pair of oxazolidin-2-ones (*R*)-**1** and (*S*)-**91** followed by the addition of pentafluorophenyl 2-phenylpropanoate (*rac*)-**15** at −78 °C gave, after 2 h, the oxazolidin-2-ones (*S*,*R*)-*syn*- and (*R*,*R*)-*anti*-**4** (ratio 60:40; 75%) and (*S*,*S*)-*syn*- and (*R*,*S*)-*anti*-**94** (ratio 57:43; 57%), respectively (Scheme 16). The oxazolidin-2-ones (*R*)-**1** and (*S*)-**91** appear to be equally diastereoselective in favouring the formation of *syn*-oxazolidin-2-ones (*S*,*R*)-**4** and (*S*,*S*)-**94** in 20% de and 14% de, respectively (Scheme 15). As these oxazolidin-2-ones (*R*)-**1** and (*S*)-**91** were competing for the same (*S*)-enantiomer of **15**, simply lowering the %conversion by reducing the reaction time would improve the overall levels of diastereocontrol. By repeating this competitive kinetic resolution, and stopping the reaction after 5 min, the *syn*-oxazolidin-2-ones (*S*,*R*)-**4** and (*S*,*S*)-**94** were obtained in 37% yield (with 88% de) and 15% yield (with 78% de), respectively with significantly improved levels of diastereoselectivity (Scheme 16). In both cases, the oxazolidin-2-one (*R*)-**1** appeared to be more nucleophilic than its complementary oxazolidin-2-one (*S*)-**91** (Scheme 16).

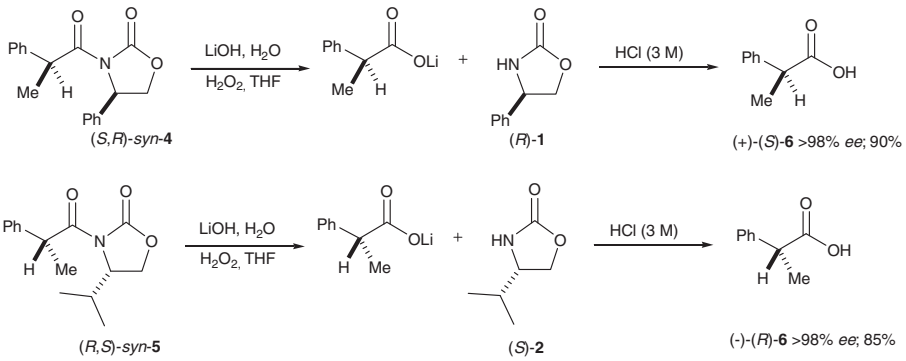
Access to the resolved and enantiomerically pure 2-phenylpropanoic acid **6** can be achieved by hydrolysis of two *quasi*-enantiomeric oxazolidin-2-one adducts, such as (*S*,*R*)-*syn*-**4** and (*R*,*S*)-*syn*-**5** (Scheme 15). Treatment of these oxazolidin-2-one (*S*,*R*)-*syn*-**4** and (*R*,*S*)-*syn*-**5** with lithium hydroxide-monohydrate in the presence of hydrogen peroxide in THF/H_2O (3:1) gave, after 12 h, the corresponding 2-phenylpropanoic acid (*S*)- and (*R*)-**6** in 90% and 85% yields with >98% ee and >98% ee, respectively (Scheme 17).

3. Conclusion

In conclusion, we have developed an improved method for the diastereoselective coupling of lithiated oxazolidin-2-ones to racemic 2-phenylpropanoic acid (*rac*)-**6** using a parallel kinetic resolution involving two complementary (*quasi*)-enantiomeric oxazolidin-2-ones [e.g., (*R*)-**1** and (*S*)-**2**]. We have found that a number of effects, such as the structural nature of the complementary (*quasi*)-enantiomeric oxazolidin-2-ones, choice of metal counter-ions and temperature, play an important role on the relative diastereoselective outcome; a lithium counter-ion and low temperature promotes formation of the *syn*-diastereoisomeric adduct. The nearest analogy to this work is the parallel kinetic resolutions reported by Fox,[9] Vedejs[4] and Davies.[3] Fox[9] has reported a related parallel kinetic resolution of racemic mixed anhydrides using a combination of *quasi*-enantiomeric designer oxazolidin-2-ones. Vedejs[4] has shown the efficient parallel kinetic resolution of 1-phenylethanol using two complementary *quasi*-enantiomeric



Scheme 16. Resolution of active ester (*rac*)-**15** using oxazolidin-2-ones (*R*)-1 and (*S*)-**91**.



Scheme 17. Hydrolysis of oxazolidin-2-ones (*S*,*R*)-*syn*-**4** and (*R*,*S*)-*syn*-**5**.

chlorocarbonates. In contrast, Davies[3] has reported the use of two *quasi*-enantiomeric lithium amides to resolve racemic enoates Interestingly, these efficient parallel kinetic resolutions[2] appear to act independent of each other in an equal and opposite stereochemical sense and give products with near perfect levels of enantio- and diastereocontrol.

4. Experimental

4.1. General

All solvents were distilled before use. All reactions were carried out under nitrogen using oven-dried glassware. Flash column chromatography was carried out using Merck Kieselgel 60 (230–400 mesh). Thin layer chromatography (TLC) was carried out on commercially available pre-coated plates (Merck Kieselgel $60F_{254}$ silica). Proton and carbon NMR spectra were recorded on a Bruker 400 MHz Fourier transform spectrometer using an internal deuterium lock. Chemical shifts are quoted in parts per million downfield from tetramethylsilane. Carbon NMR spectra were recorded with broad proton decoupling. Infrared spectra were recorded on a Shimadzu 8300 FTIR spectrometer. Optical rotations were measured using an automatic AA-10 Optical Activity Ltd polarimeter.

4.2. Synthesis of active esters

4.2.1. 4-Nitrophenyl 2-phenylpropanoate (*rac*)-14

2-Phenylpropanoic acid (*rac*)-**6** (1.02 g, 6.80 mmol) was added to a stirred solution of *N,N′*-dicyclohexylcarbodiimide (DCC) (1.61 g, 7.78 mmol) in dichloromethane (3 ml) and stirred for 15 min. A solution of 4-nitrophenol **7** (0.97 g, 6.97 mmol) in dichloromethane (3 ml) was slowly added, and the resulting solution was stirred for 12 h. The resulting precipitate *N,N′*-dicyclohexylurea (DCU) was removed by filtration using suction filtration. Water (10 mL) was added and the solution was extracted with dichloromethane (3×10 mL) and dried (over $MgSO_4$). The combined organic layers were evaporated under reduced pressure. The crude residue was purified by flash column chromatography on silica gel eluting with light petroleum (40–60 °C)/diethyl ether (9:1) to give 4-nitrophenyl 2-phenylpropanoate (*rac*)-**14** (1.63 g, 87%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.5; ν_{max} (film) cm^{-1} 1723 (C=O); δ_H (400 MHz; $CDCl_3$) 8.23 (2H, dt, *J* 8.8 and 2.4, $2 \times$ CH; Ar), 7.40–7.30 (5H, m, $5 \times$ CH; Ph), 7.18 (2H, dt, *J* 8.8 and 2.4, $2 \times$ CH; Ar), 3.99 (1H, q, *J* 7.2, PhC*H*CH_3) and 1.63 (3H, d, *J* 7.2, PhCHC*H*$_3$); δ_C (100 MHz; $CDCl_3$) 172.1 (C=O), 155.5 (*i*-CO; Ar), 145.3 (*i*-CN; Ar), 139.2 (*i*-CC; Ph), 128.9, 127.7 and 127.4 ($3 \times$ CH; Ph), 125.1 and 122.2 ($2 \times$ CH; Ar), 45.6 (Ph*C*HCH$_3$) and 18.3 (PhCH*C*H$_3$) (Found MNH_4^+, 289.1185. $C_{15}H_{17}N_2O_4$ requires MNH_4^+ 289.1183).

4.2.2. Pentafluorophenyl 2-phenylpropanoate (*rac*)-15

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (5.00 g, 33.32 mmol), DCC (7.58 g, 36.73 mmol) and pentafluorophenol **8** (6.15 g, 33.43 mmol) gave, pentafluorophenyl 2-phenylpropanoate (*rac*)-**15** (9.71 g, 92%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.56; ν_{max} (film) cm^{-1} 3100–2881 (aromatic, CH) and 1784 (C=O); δ_H (400 MHz; $CDCl_3$) 7.41–7.28 (5H, m, $5 \times$ CH; Ph), 4.07 (1H, q, *J* 7.2, PhC*H*CH_3) and 1.64 (3H, d, *J* 7.2, PhCHC*H*$_3$); δ_C (100 MHz; $CDCl_3$) 170.6 (OC=O), 141.1 (142.40 and 139.90, 2C, ddt, $^1J_{C,F} = 251.3$ Hz, $^2J_{C,F} = 12.2$ Hz and $^3J_{C,F} = 3.8$ Hz, C(2)–F), 139.4 (140.70 and 138.18, 1C, dtt, $^1J_{C,F} = 253.2$ Hz, $^2J_{C,F} = 13.4$ Hz and $^3J_{C,F} = 4.2$ Hz, C(4)-F), 138.7 (*i*-C; Ph), 137.8 (139.05 and 136.58, 2C, dtdd, $^1J_{C,F} = 249.1$ Hz, $^2J_{C,F} = 14.5$ Hz, $^3J_{C,F} = 5.7$ Hz and $^4J_{C,F} = 3.1$ Hz, C(3)-F), 128.9, 127.8 and 127.5 ($3 \times$ CH; Ar), $\times$CH; Ph), 125.2 (1C, tdt, $^2J_{C,F} = 14.2$ Hz, $^4J_{C,F} = 4.2$ Hz and $^3J_{C,F} = 2.0$ Hz, *i*-CO; OC_6F_5), 45.1 (PhCH) and 18.5 (CH_3CH); δ_F (378 MHz; $CDCl_3$) −152.6 (2F, d, $^3J_{F,F}$ 20.9, F_{ortho}), −157.9 (1F, t, $^3J_{F,F}$ 20.9, F_{para}) and −162.3 (2F, t, $^3J_{F,F}$ 20.9, F_{meta}) (Found M^+, 316.0514. $C_{15}H_9F_5O_2$ requires M^+, 316.0517).

4.2.3. Pentafluorophenyl 2-phenylpropanoate (−)-(*R*)-15

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*R*)-**6** (3.0 g, 20.0 mmol), DCC (4.53 g, 22.00 mmol) and pentafluorophenol **8** (4.90 g, 26.70 mmol) gave, pentafluorophenyl 2-phenylpropanoate (*R*)-**15** (5.37 g, 85%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.56; $[\alpha]_D^{25} = -75.0$ (*c* 3.3, $CHCl_3$); ν_{max} ($CHCl_3$) cm^{-1} 1779 (C=O) (Found M^+, 316.0521; $C_{15}H_9F_5O_2$ requires M^+, 316.0517).

4.2.4. Pentafluorophenyl 2-phenylpropanoate (+)-(*S*)-15

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*R*)-**6** (4.0 g, 26.7 mmol), DCC (6.04 g, 29.3 mmol) and pentafluorophenol **8** (6.54 g, 35.64 mmol) gave, pentafluorophenyl 2-phenylpropanoate (*S*)-**15** (7.32 g, 87%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.56; $[\alpha]_D^{25} = +74.5$ (*c* 4.9, $CHCl_3$); ν_{max} ($CHCl_3$) cm^{-1} 1779 (C=O) (Found M^+, 316.0521; $C_{15}H_9F_5O_2$ requires M^+, 316.0517).

4.2.5. 2-(4,5-Dihydro-oxazol-2-yl)phenyl 2-phenylpropanoate (*rac*)-16

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (0.105 g, 0.7 mmol), DCC (0.163 g, 0.79 mmol) and 2-(4,5-dihydro-oxazol-2-yl) phenol **9** (0.12 g, 0.7 mmol) gave, the active ester (*rac*)-**16** (70 mg, 34%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (7:3)] 0.5; ν_{max} (film) cm^{-1} 1718 (C=O); δ_H (400 MHz; $CDCl_3$) 7.65 (1H, dd, *J* 8.1 and 1.1, Ar), 7.40–7.25 (6H, m, $5 \times$ CH; Ph and Ar), 7.00 (1H, dd, *J* 8.1 and 1.1, CH; Ar), 6.86 (1H, td, *J* 8.1 and 1.1, CH; Ar), 4.45 (2H, t, *J* 9.4, CH_2O), 4.09 (2H, t, *J* 9.4, CH_2N), 3.93 (1H, m, PhC*H*CH_3) and 1.46 (3H, d, *J* 6.9, PhCHC*H*$_3$); δ_C (100 MHz; $CDCl_3$) 171.0 (C=O), 159.9 (C=N), 154.0 (*i*-CO; Ar), 141.6 (*i*-CC; Ph), 133.2 (*i*-CC; Ar), 128.8,[1] 127.9,[1] 127.2,[1] 127.0,[2] 118.5[1] and 116.6[1] ($7 \times$ CH; Ph and Ar), 66.7 (CH_2O), 49.8 (CH_2N), 45.7 (PhC*H*CH_3) and 20.9 (PhCHC*H*$_3$); *m*/z 105.1 (100%, $PhCH_2^+$).

4.2.6. 1-Phenyl-1-methylacetoxy-1-benzotriazole (*rac*)-17

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (5.01 g, 33.33 mmol), DCC (7.63 g, 37.03 mmol) and BtOH **10** (5.49 g, 40.6 mmol) gave, the active ester (*rac*)-**18** (4.37 g, 49%) as a colourless oil; R_F [diethyl ether] 0.63; ν_{max} (film) cm^{-1} 1718 (C=O); δ_H (400 MHz; $CDCl_3$) 8.40[A] (1H, d *J* 8.2, CH; Ar), 8.03[B] (1H, d *J* 8.2, CH; Ar), 7.96[A] (1H, d *J* 8.2, CH; Ar), 7.70[B] (1H, dd, *J* 8.2 and 7.1, CH; Ar), 7.50 (1H, dd, *J* 8.2 and 7.1, CH; Ar), 7.55–7.25 (6H, m, $5 \times$ CH; Ph and CH;[A] Ar), 6.98[B] (1H, d, *J* 8.2, CH; Ar), 4.94[A] (1H, q, *J* 7.3, PhC*H*CH_3), 4.24[B] (1H, d, *J* 7.3, PhC*H*CH_3), 1.73[A] (3H, d, *J* 7.3, PhCHC*H*$_3$) and 1.70[B] (3H, d, *J* 7.3, PhCHC*H*$_3$); δ_C (100 MHz; $CDCl_3$) 170.9 and 170.6 ($2 \times$ C=O), 143.3 ($2 \times$ *i*-CC; Ph), 138.6 and 137.9 ($2 \times$ *i*-CN; Ar), 132.7 ($2 \times$ *i*-CN; Ar), 129.2, 128.9, 127.9 and 127.4 ($4 \times$ CH; Ph[A] and Ph[B]), 132.9, 128.6, 128.2, 124.7, 120.4, 116.1, 115.4 and 107.9 ($8 \times$ CH; Ar[A] and Ar[B]), 44.4 and 43.5 ($2 \times$ PhC*H*CH_3), 18.6 and 18.2 ($2 \times$ PhCHC*H*$_3$) (Found MH^+, 268.1082; $C_{15}H_{14}N_3O_2$ requires MH^+, 268.1081). A and B are rotamers (ratio 43:57), where A is the minor and B is the major rotamer.

4.2.7. 2,5-Dioxo-pyrrolidin-1-yl 2-phenylpropanoate (*rac*)-18

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.01 g, 6.70 mmol), DCC (1.52 g, 7.38 mmol) and *N*-hydroxysuccinimide **11** (0.79 g, 6.89 mmol) gave, the active ester (*rac*)-**18** (0.95 g, 57%) as a colourless oil; R_F [light petroleum

(40–60 °C)/diethyl ether (7:3)] 0.33; ν_{max} (film) cm^{-1} 1714 (C=O); δ_H (400 MHz; $CDCl_3$) 7.39–7.28 (5H, m, 5 × CH; Ph), 4.06 (1H, q, *J* 7.1, PhC*H*CH_3), 2.80 (4H, m, 2 × CH_2C=O) and 1.65 (3H, d, *J* 7.1, PhCHCH_3); δ_C (100 MHz; $CDCl_3$) 169.8 and 169.0 (2 × C=O), 138.1 (*i*-CC; Ph), 128.8, 127.7 and 127.5 (3 × CH; Ph), 42.9 (PhC*H*CH_3), 25.5 (2 × CH_2) and 18.9 (PhCHCH_3) (Found MNH_4^+, 265.1186. $C_{13}H_{17}N_2O_4$ requires MNH_4^+, 265.1183).

4.2.8. 2-Phenylpropanoyl 2-phenylpropanoate (*rac*)- and (*meso*)-19

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.0 g, 6.65 mmol) and DCC (1.60 g, 7.77 mmol) gave, 2-phenylpropanoyl 2-phenylpropanoate (*rac*)- and (*meso*)-**19** (0.6 g, 64%) as a colourless oil [ratio (*rac*)-:(*meso*)- = 50:50]; R_F [light petroleum (40–60 °C)/diethyl ether (7:3)] 0.56; ν_{max} (film) cm^{-1} 1770 (C=O) and 1712 (C=O); δ_H (400 MHz; $CDCl_3$) 7.34–7.23 (6H, m, 6 × CH; Ph^{A+B}), 7.14–7.08 (4H, m, 4 × CH; Ph^{A+B}), 3.69 (1H, q, *J* 7.1, PhC*H*CH_3^{AorB}), 3.67 (1H, q, *J* 7.1, PhC*H*CH_3^{AorB}), 1.44 (3H, d, *J* 7.1, PhCHCH_3^{AorB}) and 1.43 (3H, d, *J* 7.1, PhCHCH_3^{AorB}); δ_C (100 MHz; $CDCl_3$) 169.6 and 169.5 (2 × C=O), 138.6 and 138.5 (2 × *i*-CC; Ph), 128.8, 128.7 and 127.7 (6 × CH; Ph^{A+B}), 46.4 and 46.3 (2 × Ph*C*HCH_3), 17.7 and 17.6 (2 × PhCH*C*H_3); *m/z* 104.9 (100%, $PhCH^+CH_3$) and 150.1 (10, $PhCHMeCO_2H$).

4.2.9. 2-Phenyl-propanoic pivalonic anhydride (*rac*)-20

At first, *n*-BuLi (0.44 mL, 2.5 M in hexanes, 1.11 mmol) was added to a stirred solution of 2-phenylpropanoic acid (*rac*)-**6** (0.15 g, 1.01 mmol) in THF (5 mL) at −78 °C. The resulting solution was stirred for 10 min. Pivaloyl chloride **12** (0.121 g, 1.01 mmol) in THF (2 mL) was slowly added, and the resulting solution was stirred for 2 h. This solution of 2-phenyl-propanoic pivalonic anhydride (*rac*)-**20** was used as prepared.

4.2.10. 2-Phenyl-propanoic adamantanoic anhydride (*rac*)-21

At first, *n*-BuLi (0.44 mL, 2.5 M in hexanes, 1.11 mmol) was added to a stirred solution of 2-phenylpropanoic acid (*rac*)-**6** (0.15 g, 1.01 mmol) in THF (5 mL) at −78 °C. The resulting solution was stirred for 10 min. Adamantyl carbonyl chloride (0.2 g, 1.01 mmol) in THF (2 mL) was slowly added, and the resulting solution was stirred for 2 h. This solution of 2-phenyl-propanoic adamantanoic anhydride (*rac*)-**21** was used as prepared.

4.3. General procedure for the mutual kinetic resolutions of active esters (*rac*)-14–21 using oxazolidin-2-one (*rac*)-1

At first, *n*-BuLi (0.44 ml, 2.5 M in hexane, 1.1 mmol) was added to a stirred solution of oxazolidin-2-one (*rac*)-**1** (0.163 g, 1.0 mmol) in THF (5 ml) at −78 °C. After stirring for 1 h, a solution of the given active ester (*rac*)-**14–21** (1.1 mmol) in THF (1 ml) was added. The resulting mixture was stirred for 2 h at −78 °C. The reaction was quenched with water (10 ml). The organic layer was extracted with diethyl ether (2 × 10 ml), dried (over $MgSO_4$) and evaporated under reduced pressure to give a separable mixture of two diastereoisomeric oxazolidin-2-ones *syn*- and *anti*-**4**. The crude mixture was purified by flash column chromatography on silica gel eluting with light petroleum (bp 40–60 °C)/diethyl ether (7:3) to give the oxazolidin-2-ones *syn*- and *anti*-**4** as white needle-like crystals.

Characterisation data for: (4*RS*)-4-phenyl-3-(2*SR*-phenylpropanoyl)oxazolidin-2-one (*rac*)-*syn*-**4**; white solid; mp 124–126 °C; R_F [light petroleum (bp 40–60 °C)/diethyl ether (1:1)] 0.42; ν_{max} ($CHCl_3$); cm^{-1} 1778 (C=O) and 1701 (C=O); δ_H (400 MHz; $CDCl_3$) 7.29–7.21 (10H, m, 10 × CH; 2 × Ph), 5.45 (1H, dd *J* 9.0 and 5.1, PhCHN), 5.09 (1H, q, *J* 6.9, PhC*H*CH_3), 4.63 (1H, t, *J* 9.0, CH_AH_BO), 4.08 (1H, dd, *J* 9.0 and 5.1, CH_AH_BO) and 1.39 (3H, d, *J* 6.9, PhCHCH_3); δ_C (100 MHz; $CDCl_3$) 173.7 (NC=O), 153.2 (OC=O), 139.9 (*i*-C; Ph_A), 138.3 (*i*-C; Ph_B), 128.9[2], 128.7[1], 128.5[2], 128.2[2], 127.1[1] and 125.9[2] (10 × CH; Ph_A and Ph_B), 69.6 (CH_2O), 57.9 (PhCHN), 43.9 (PhCHCH$_3$) and 18.6 (PhCHCH_3) (Found MH^+, 296.1286; $C_{15}H_{18}NO_3^+$ requires 296.1287); *m/z* 295.1 (10%, M^+), 132.1 (100, Ph(CH_3)C=C=O^+), 105.1 (25, $PhCH_2^+$) and 77.1 (20, Ph^+); and (4*RS*)-4-phenyl-3-(2*RS*-phenylpropanoyl)oxazolidin-2-one (*rac*)-*anti*-**4**; white solid; mp 106–108 °C; R_F [light petroleum (bp 40–60 °C)/diethyl ether (1:1)] 0.58; ν_{max} ($CHCl_3$) cm^{-1} 1780 (C=O) and 1700 (C=O); δ_H (400 MHz; $CDCl_3$) 7.39–7.26 (10H, m, 10 × CH; 2 × Ph), 5.32 (1H, dd, *J* 8.8 and 3.2, PhCHN), 5.11 (1H, q, *J* 7.2, PhC*H*CH_3), 4.55 (1H, t, *J* 8.8, CH_AH_BO), 4.21 (1H, dd, *J* 8.8 and 3.2, CH_AH_BO) and 1.40 (3H, d, *J* 7.2, PhCHCH_3); δ_C (100 MHz; $CDCl_3$) 174.1 (NC=O), 152.9 (OC=O), 140.2 (*i*-C; Ph_A), 139.4 (*i*-C; Ph_B), 129.3[2], 128.7[1], 128.6[2], 128.2[2], 127.3[1] and 125.8[2] (10 × CH; Ph_A and Ph_B), 69.7 (CH_2O), 58.1 (PhCHN), 43.2 (PhC*H*CH_3) and 19.4 (PhCHCH_3) (Found MH^+, 296.1282; $C_{18}H_{18}NO_3^+$ requires 296.1287).

Active ester (*rac*)-**14**, gave a mixture (87:13) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.201 g, 68%).

Active ester (*rac*)-**15**, gave a mixture (97:3) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.206 g, 70%).

Active ester (*rac*)-**16**, gave a mixture (90:10) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.103 g, 35%).

Active ester (*rac*)-**17**, gave a mixture (76:24) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.124 g, 42%).

Active ester (*rac*)-**18**, gave a mixture (84:16) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.118 g, 40%).

Active ester (*rac*)-**19**, gave a mixture (43:57) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.177 g, 60%).

Active ester (*rac*)-**20**, gave a mixture (54:46) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.185 g, 63%).

Active ester (*rac*)-**21**, gave a mixture (65:35) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.118 g, 40%).

4.3.1. 2-Fluorophenyl 2-phenylpropanoate (*rac*)-53

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.01 g, 6.75 mmol), DCC (1.56 g, 7.54 mmol) and 2-fluorophenol **22** (0.76 g, 0.61 mL, 6.78 mmol) gave, after purification by column chromatography eluting with light petroleum (40–60 °C)-diethyl ether, 2-fluorophenyl 2-phenylpropanoate (*rac*)-**53** (1.37 g, 83%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.28; ν_{max} (film) cm^{-1} 1759 (C=O); δ_H (400 MHz; $CDCl_3$) 7.43–6.98 (9H, m, 9 × CH; Ar and Ph), 4.02 (1H, q, *J* 7.2, PhC*H*CH_3) and 1.63 (3H, d, *J* 7.2, PhCHCH_3); δ_C (100 MHz; $CDCl_3$) 172.1 (C=O), 154.1 (1C, d, *J* 249.6, *i*-CF; Ar), 139.8 (*i*-CC; Ph), 138.3 (1C, d, *J* 13.0, *i*-CO; Ar), 128.8, 127.6 and 127.4 (3 × CH; Ph), 127.0 (1C, d, *J* 7.1, CH; Ar), 124.3 (1C, d, *J* 4.0, CH; Ar), 123.6 (CH; Ar), 116.6 (1C, d, *J* 19.1, CH; Ar), 45.4 (PhCHCH$_3$) and 18.7 (PhCHCH_3) (Found MNH_4^+, 262.1240. $C_{15}H_{17}FNO_2$ requires MNH_4^+, 262.1238).

4.3.2. 2-Chlorophenyl 2-phenylpropanoate (*rac*)-54

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**16** (1.02 g, 6.77 mmol), DCC (1.57 g, 7.59 mmol) and 2-chlorophenol **23** (0.87 g, 0.70 mL, 6.77 mmol) gave, 2-chlorophenyl 2-phenylpropanoate (*rac*)-**54** (1.54 g, 87%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.26; ν_{max} (film) cm^{-1} 1763 (C=O); δ_H (400 MHz; $CDCl_3$) 7.45–7.11 (8H, m, 8 × CH; Ph and Ar), 7.02 (1H, dd, *J* 7.9 and 1.7, 1 × CH; Ph or Ar), 4.03 (1H, q, *J* 7.2, PhC*H*CH_3) and 1.66 (3H, d, *J* 7.2, PhCHCH_3); δ_C (100 MHz; $CDCl_3$) 172.1 (C=O), 147.1 (*i*-CO; Ar), 139.6 (*i*-CC; Ph), 127.4 (*i*-CCl; Ar), 130.3, 128.8, 128.5, 127.8, 127.6, 126.9 and 123.0 (7 × CH; Ph and Ar), 45.5 (PhCHCH$_3$) and 18.5 (PhCHCH_3) (Found MNH_4^+, 278.0941. $C_{15}H_{17}ClNO_2$ requires MNH_4^+, 278.0942).

4.3.3. 2-Bromophenyl 2-phenylpropanoate (*rac*)-55

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.00 g, 6.66 mmol), DCC (1.52 g, 7.34 mmol) and 2-bromophenol **24** (1.16 g, 6.71 mmol) gave, 2-bromophenyl 2-phenylpropanoate (*rac*)-**55** (1.62 g, 80%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.29; ν_{max} (film) cm^{-1} 1750 (C=O); δ_H (400 MHz; $CDCl_3$) 7.55 (1H, dd, *J* 7.9 and 1.5, 1 × CH, Ar), 7.46–7.18 (6H, m, 6 × CH, Ph and Ar), 7.07 (1H, td, *J* 7.9 and 1.5, 1 × CH; Ar), 7.01 (1H, dd, *J* 7.9 and 1.5, 1 × CH; Ar), 4.03 (1H, q, *J* 7.2, PhC*H*CH_3) and 1.67 (3H, d, *J* 7.2, PhCHC*H*$_3$); δ_C (100 MHz; $CDCl_3$) 172.1 (C=O), 148.2 (*i*-CO; Ar), 139.6 (*i*-CC; Ph), 116.1 (*i*-CBr; Ar), 133.4, 128.9, 128.3, 127.8, 127.5, 127.2 and 123.6 (7 × CH; Ph and Ar), 45.6 (Ph*C*HCH$_3$) and 18.5 (PhCH*C*H$_3$) (Found MNH_4^+, 322.0435. $C_{15}H_{17}BrNO_2$ requires MNH_4^+, 322.0437).

4.3.4. 3-Fluorophenyl 2-phenylpropanoate (*rac*)-56

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.50 g, 9.88 mmol), DCC (2.26 g, 10.86 mmol) and 3-fluorophenol **25** (1.10 g, 0.91 mL, 9.88 mmol) gave, 3-fluorophenyl 2-phenyl-propanoate (*rac*)-**56** (1.73 g, 72%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (1:1)] 0.61; ν_{max} (CH_2Cl_2) cm^{-1} 1760 (C=O); δ_H (400 MHz; $CDCl_3$) 7.42–7.35 (3H, m, 3 × CH; Ph), 7.32–7.27 (3H, m, 3 × CH; Ar and Ph), 6.95 (1H, td, *J* 8.2 and 2.4, CH; Ar), 6.82 (1H, br d, *J* 8.2, CH; Ar), 6.78 (1H, dt, *J* 8.2 and 2.4, CH; Ar), 3.97 (1H, q, *J* 7.1, PhC*H*CH_3) and 1.63 (3H, d, *J* 7.1, PhCHC*H*$_3$); δ_C (100 MHz; $CDCl_3$) 172.6 (C=O), 162.7 (1C, d, $^1J_{C,F}$ = 245.9, *i*-CF; Ar), 151.5 (1C, d, $^3J_{C,F}$ = 10.7, *i*-CO; Ar), 139.7 (*i*-C; Ph), 130.0 (1C, d, $^3J_{C,F}$ = 9.1, CH; Ar), 128.8[2] and 127.4[3] (5 × CH; Ph), 117.1 (1C, d, $^4J_{C,F}$ = 3.8, CH; Ar), 112.7 (1C, d, $^2J_{C,F}$ = 20.6, CH; Ar), 109.4 (1C, d, $^2J_{C,F}$ = 24.4, CH; Ar), 45.5 (Ph*C*HCH$_3$) and 18.4 (PhCH*C*H$_3$); δ_F (378 MHz; $CDCl_3$) −111.0 (1F, s, CF) (Found MNH_4^+, 262.1240. $C_{15}H_{17}FNO_2$ requires MNH_4^+, 262.1240).

4.3.5. 3-Chlorophenyl 2-phenylpropanoate (*rac*)-57

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.50 g, 9.98 mmol), DCC (2.26 g, 10.86 mmol) and 3-chlorophenol **26** (1.28 g, 9.98 mmol) gave, 3-chlorophenyl 2-phenyl-propanoate (*rac*)-**57** (1.58 g, 61%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (1:1)] 0.55; ν_{max} (CH_2Cl_2) cm^{-1} 1758 (C=O); δ_H (400 MHz; $CDCl_3$) 7.42–7.38 (3H, m, 3 × CH; Ph), 7.36–7.32 (2H, m, 2 × CH; Ph), 7.27 (1H, t, *J* 8.1, CH; Ar), 7.20 (1H, ddd, *J* 8.1, 2.4 and 1.2, CH; Ar), 7.05 (1H, t, *J* 2.4, CH; Ar), 6.92 (1H, ddd, *J* 8.1, 2.4 and 2.1, CH; Ar), 3.97 (1H, q, *J* 7.1, PhC*H*CH_3) and 1.63 (3H, d, *J* 7.1, PhCHC*H*$_3$); δ_C (100 MHz; $CDCl_3$) 172.5 (C=O), 151.2 (*i*-CO; Ar), 139.6 (*i*-C; Ph), 134.5 (*i*-CCl; Ar), 130.0, 126.0, 122.0 and 119.7 (4 × CH; Ar), 128.8,[2] 127.5,[1] and 127.4[2] (5 × CH; Ph), 45.3 (Ph*C*HCH$_3$) and 18.4 (PhCH*C*H$_3$) (Found MNH_4^+, 278.0942 $C_{15}H_{17}ClNO_2$ requires MNH_4^+, 278.0946).

4.3.6. 4-Fluorophenyl 2-phenylpropanoate (*rac*)-58

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.02 g, 6.76 mmol), DCC (1.54 g, 7.48 mmol) and 4-fluorophenol **27** (0.77 g, 6.83 mmol) gave, 4-fluorophenyl 2-phenylpropanoate (*rac*)-**58** (1.38 g, 84%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.31; ν_{max} (film) cm^{-1} 1755 (C=O); δ_H (400 MHz; $CDCl_3$) 7.40–7.26 (5H, m, 5 × CH; Ph and Ar), 7.05–6.91 (4H, m, 4 × CH; Ph and Ar), 3.94 (1H, q, *J* 7.2, PhC*H*CH_3) and 1.60 (3H, d, *J* 7.2, PhCHC*H*$_3$); δ_C (100 MHz; $CDCl_3$) 173.1 (C=O), 160.2 (1C, d, *J* 244.4, *i*-CF; Ar), 146.6 (*i*-CO; Ar), 139.9 (*i*-CC; Ph), 128.8, 127.5 and 127.4 (3 × CH; Ph), 122.8 (1C, d, *J* 9.0, CH; Ar), 116.0 (1C, d, *J* 23.1, CH), 45.6 (Ph*C*HCH$_3$) and 18.5 (PhCH*C*H$_3$) (Found MNH_4^+, 262.1240. $C_{15}H_{17}FNO_2$ requires MNH_4^+ 262.1238).

4.3.7. 4-Chlorophenyl 2-phenylpropanoate (*rac*)-59

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.01 g, 6.71 mmol), DCC (1.53 g, 7.43 mmol) and 4-chlorophenol **28** (1.11 g, 8.64 mmol) gave, 4-chlorophenyl 2-phenylpropanoate (*rac*)-**59** (1.60 g, 91%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.38; ν_{max} (film) cm^{-1} 1756 (C=O); δ_H (400 MHz; $CDCl_3$) 7.38–7.21 (7H, m, 7 × CH; Ph and Ar), 6.92 (2H, dt, *J* 8.9 and 2.2, 2 × CH; Ar), 3.94 (1H, q, *J* 7.2, PhC*H*CH_3) and 1.60 (3H, d, *J* 7.2, PhCHC*H*$_3$); δ_C (100 MHz; $CDCl_3$) 172.8 (C=O), 149.3 (*i*-CO; Ar), 139.8 (*i*-CC; Ph), 131.2 (*i*-CCl; Ar), 129.4, 128.9, 128.6, 127.5 and 122.8 (5 × CH; Ph and Ar), 45.6 (Ph*C*HCH$_3$) and 18.5 (PhCH*C*H$_3$) (Found MNH_4^+, 278.0941. $C_{15}H_{17}ClNO_2$ requires MNH_4^+, 278.0942).

4.3.8. 4-Bromophenyl 2-phenylpropanoate (*rac*)-60

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.01 g, 6.73 mmol), DCC (1.54 g, 7.46 mmol) and 4-bromophenol **29** (1.19 g, 6.85 mmol) gave, 4-bromophenyl 2-phenylpropanoate (*rac*)-**60** (1.79 g, 87%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.39; ν_{max} (film) cm^{-1} 1750 (C=O); δ_H (400 MHz; $CDCl_3$) 7.46–7.21 (7H, m, 7 × CH; Ph and Ar), 6.87 (2H, dt, *J* 8.7 and 2.0, 2 × CH; Ar), 3.94 (1H, q, *J* 7.2, PhC*H*CH_3) and 1.60 (3H, d, *J* 7.2, PhCHC*H*$_3$); δ_C (100 MHz; $CDCl_3$) 172.7 (C=O), 149.8 (*i*-CO; Ar), 139.8 (*i*-CC; Ph), 118.8 (*i*-CBr; Ar), 132.2, 128.8, 128.6, 127.5 and 123.2 (5 × CH; Ph and Ar), 45.6 (Ph*C*HCH$_3$) and 18.5 (PhCH*C*H$_3$) (Found MNH_4^+, 322.0438. $C_{15}H_{17}BrNO_2$ requires MNH_4^+, 322.0437).

4.3.9. 2,3-Dichlorophenyl 2-phenylpropanoate (*rac*)-61

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.22 g, 8.12 mmol), DCC (1.84 g, 8.93 mmol) and 2,3-dichlorophenol **30** (1.32 g, 8.12 mmol) gave, 2,3-dichlorophenyl 2-phenylpropanoate (*rac*)-**61** (1.59 g, 67%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.51; ν_{max} (film) cm^{-1} 1763 (C=O); δ_H (400 MHz; $CDCl_3$) 7.45–7.30 (6H, m, 6 × CH; Ph and Ar), 7.17 (1H, t, *J* 8.1, CH; Ar), 6.96 (1H, dd, *J* 8.2 and 1.5, CH; Ar), 4.05 (1H, q, *J* 7.2, PhC*H*CH_3) and 1.68 (3H, d, *J* 7.2, PhCHC*H*$_3$); δ_C (100 MHz; $CDCl_3$) 171.7 (C=O), 148.2 (*i*-CO; Ar), 139.2 (*i*-CC; Ph), 133.8 (*i*-CCl; Ar), 128.7,[2] 127.8,[1] 127.7,[2] 127.5,[1] 127.3[1] and 121.7[1] (8 × CH; Ar and Ph), 126.4 (*i*-CCl; Ar), 45.4 (Ph*C*HCH$_3$) and 18.4 (PhCH*C*H$_3$) (Found MNH_4^+, 312.0555 $C_{15}H_{16}Cl_2NO_2$ requires MNH_4^+, 312.0553).

4.3.10. 2,4-Dichlorophenyl 2-phenylpropanoate (*rac*)-62

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (5.01 g, 33.36 mmol), DCC (7.58 g, 36.72 mmol) and 2,4-dichlorophenol **31** (5.45 g, 33.44 mmol) gave, 2,4-dichlorophenyl 2-phenylpropanoate (*rac*)-**62** (9.01 g, 92%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.35; ν_{max} (film) cm^{-1} 1762 (C=O); δ_H (400 MHz; $CDCl_3$) 7.43–7.26 (6H, m, 6 × CH; Ph and Ar), 7.20 (1H, dd, *J* 8.4 and 2.5, 1 × CH; Ar), 6.96 (1H, d, *J* 8.4, 1 × CH; Ar), 4.01 (1H, q, *J* 7.2, PhC*H*CH_3) and 1.65 (3H, d, *J* 7.2, PhCHC*H*$_3$); δ_C (100 MHz; $CDCl_3$) 172.3 (C=O); 146.1 (*i*-CO; Ar), 139.7 (*i*-CC; Ph), 132.2 and 128.2 (2 × *i*-CCl; Ar), 130.4, 129.1, 128.3, 128.1, 129.9 and 124.8 (6 × CH; Ph and Ar), 45.8 (Ph*C*HCH$_3$) and 18.8 (PhCH*C*H$_3$) (Found MNH_4^+, 312.0553. $C_{15}H_{16}Cl_2NO_2$ requires MNH_4^+, 312.0553).

4.3.11. 2,5-Dichlorophenyl 2-phenylpropanoate (*rac*)-63

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (2.01 g, 13.41 mmol), DCC (3.08 g, 14.91 mmol) and 2,5-dichlorophenol **32** (2.20 g, 13.48 mmol) gave, 2,5-dichlorophenyl 2-phenylpropanoate (*rac*)-**63** (3.44 g, 87%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.41; ν_{max} (film) cm^{-1} 1767 (C=O); δ_H (400 MHz; $CDCl_3$) 7.43–7.25 (6H, m, 6 × CH; Ph and Ar), 7.14 (1H, dd, *J* 8.7 and 2.5, 1 × CH; Ar), 7.05

(1H, d, *J* 2.5, 1 × CH; Ar), 4.02 (1H, q, *J* 7.2, PhC*H*CH_3) and 1.66 (3H, d, *J* 7.2, PhCH$C\mathit{H}_3$); δ_C (100 MHz; $CDCl_3$) 172.1 (C=O), 147.8 (*i*-OC; Ar), 139.7 (*i*-CC; Ph), 133.2 and 126.0 (2 × *i*-CCl; Ar), 131.2, 129.2, 128.1, 128.0, 127.5 and 124.5 (6 × CH; Ph and Ar), 45.8 (PhCHCH$_3$) and 18.8 (PhCH$C\mathit{H}_3$) (Found MNH_4^+, 312.0554. $C_{15}H_{16}Cl_2NO_2$ requires MNH_4^+, 312.0553).

4.3.12. 2,6-Dichlorophenyl 2-phenylpropanoate (*rac*)-64

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (2.01 g, 13.38 mmol), DCC (3.04 g, 14.73 mmol) and 2,6-dichlorophenol **33** (2.20 g, 13.48 mmol) gave, 2,6-dichlorophenyl 2-phenylpropanoate (*rac*)-**64** (3.33 g, 84%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.33; ν_{max} (film) cm^{-1} 1771 (C=O); δ_H (400 MHz; $CDCl_3$) 7.46 (2H, dd, *J* 8.2 and 1.2, 2 × CH; Ar), 7.37 (2H, td, *J* 7.1 and 2.2, 2 × CH; Ph), 7.33–7.28 (3H, m, 3 × CH; Ph), 7.08 (1H, td, 8.2 and 1.2, CH; Ar), 4.09 (1H, q, *J* 7.2, PhC*H*CH_3) and 1.70 (3H, d, *J* 7.2, PhCHCH_3); δ_C (100 MHz; $CDCl_3$) 171.2 (C=O), 144.4 (*i*-CO; Ar), 139.5 (*i*-CC; Ph), 129.4 (*i*-CCl; Ar), 129.0, 128.6, 128.3, 127.9 and 127.4 (5 × CH; Ph and Ar), 45.7 (PhCHCH$_3$) and 18.8 (PhCHCH_3) (Found MNH_4^+, 312.0549. $C_{15}H_{14}Cl_2NO_2$ requires MNH_4^+, 312.0533).

4.3.13. 3,4-Dichlorophenyl 2-phenylpropanoate (*rac*)-65

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.53 g, 10.2 mmol), DCC (2.31 g, 11.2 mmol) and 3,4-dichlorophenol **34** (1.66 g, 10.2 mmol) gave, 3,4-dichlorophenyl 2-phenylpropanoate (*rac*)-**65** (2.00 g, 67%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.67; ν_{max} (CH_2Cl_2) cm^{-1} 1760 (C=O); δ_H (400 MHz; $CDCl_3$) 7.40–7.36 (6H, m, 6 × CH; Ar and Ph), 7.14 (1H, d, *J* 2.5, CH; Ar), 7.14 (1H, dd, *J* 8.8 and 2.5, CH; Ar), 3.93 (1H, q, *J* 7.2, PhC*H*CH_3) and 1.61 (3H, d, *J* 7.2, PhCHCH_3); δ_C (100 MHz; $CDCl_3$) 172.4 (C=O), 149.3 (*i*-CO; Ar), 139.4 (*i*-CC; Ph), 132.8 (*i*-CCl; Ar), 129.6 (*i*-CCl; Ar), 128.9,[2] 127.5,[1] and 127.4[2] (5 × CH; Ar), 130.5, 123.6 and 121.0 (3 × CH; Ar), 45.5 (PhCHCH$_3$) and 18.4 (PhCHCH_3) (Found $M(^{35}Cl)^+$, 294.0209. $C_{15}H_{12}Cl_2O_2$ requires $M(^{35}Cl)^+$, 294.0209).

4.3.14. 3,5-Dichlorophenyl 2-phenylpropanoate (*rac*)-66

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.5 g, 9.99 mmol), DCC (2.27 g, 10.9 mmol) and 3,5-dichlorophenol **35** (1.63 g, 9.99 mmol) gave, 3,5-dichlorophenyl 2-phenylpropanoate (*rac*)-**66** (1.52 g, 52%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.47; ν_{max} (CH_2Cl_2) cm^{-1} 1766 (C=O); δ_H (400 MHz; $CDCl_3$) 7.42–7.35 (4H, m, 4 × CH; Ph), 7.35–7.30 (1H, m, CH; Ph), 7.21 (1H, t, *J* 1.8, CH; Ar), 6.95 (2H, d, *J* 1.8, 2 × CH; Ar), 3.95 (1H, q, *J* 7.2, PhC*H*CH_3) and 1.60 (3H, d, *J* 7.2, PhCHCH_3); δ_C (100 MHz; $CDCl_3$) 172.1 (C=O), 151.4 (*i*-CO; Ar), 139.7 (*i*-CC; Ph), 135.0[2] (2 × CCl; Ar), 128.9,[2] 127.4[2] and 126.2[1] (5 × CH; Ph), 127.6[1] and 120.6[2] (3 × CH; Ar), 45.5 (PhCHCH$_3$) and 18.3 (PhCHCH_3) (Found $M(^{35}Cl)^+$, 294.0209. $C_{15}H_{12}Cl_2O_2$ requires $M(^{35}Cl)^+$, 294.0209).

4.3.15. 2,4,5-Trichlorophenyl 2-phenylpropanoate (*rac*)-67

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.02 g, 6.76 mmol), DCC (1.55 g, 7.52 mmol) and 2,4,5-trichlorophenol **36** (1.34 g, 6.80 mmol) gave, 2,4,5-trichlorophenyl 2-phenylpropanoate (*rac*)-**67** (1.92 g, 86%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.31; ν_{max} (film) cm^{-1} 3100–2876 (aromatic, CH) and 1767 (C=O); δ_H (400 MHz; $CDCl_3$) 7.50 (1H, s, 1 × CH; Ar), 7.39–7.25 (5H, m, 5 × CH; Ph), 7.16 (1H, s, 1 × CH; Ar), 4.01 (1H, q, *J* 7.2, PhC*H*CH_3) and 1.65 (3H, d, *J* 7.2, PhCHCH_3); δ_C (100 MHz; $CDCl_3$) 171.6 (C=O), 145.1 (*i*-CO; Ar), 139.1 (*i*-CC; Ph), 131.4, 130.5 and 126.2 (3 × *i*-CCl; Ar), 131.0, 128.8, 127.9, 127.6 and 125.2 (5 × CH; Ph and Ar), 45.4 (PhCHCH$_3$) and 18.4 (PhCHCH_3) (Found M^+ (^{35}Cl), 327.9825. $C_{15}H_{11}Cl_3O_2$ requires M^+ (^{35}Cl), 327.9819).

4.3.16. 2,4,6-Trichlorophenyl 2-phenylpropanoate (*rac*)-68

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (4.02 g, 26.77 mmol), DCC (6.13 g, 29.71 mmol) and 2,4,6-trichlorophenol **37** (5.29 g, 26.81 mmol) gave, 2,4,6-trichlorophenyl 2-phenylpropanoate (*rac*)-**68** (5.66 g, 64%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.53; ν_{max} (film) cm^{-1} 1769 (C=O); δ_H (400 MHz; $CDCl_3$) 7.44–7.25 (7H, m, 7 × CH; Ph and Ar), 4.07 (1H, q, *J* 7.2, PhC*H*CH_3) and 1.68 (3H, d, *J* 7.2, PhCHCH_3); δ_C (100 MHz; $CDCl_3$) 170.7 (C=O), 142.9 (*i*-CO; Ar), 138.9 (*i*-CC; Ph), 131.1 and 129.6 (2 × *i*-CCl; Ar), 128.7, 128.5, 127.9 and 127.6 (4 × CH; Ar), 45.2 (PhCHCH$_3$) and 18.3 (PhCHCH_3) (Found MNH_4^+, 346.0166. $C_{15}H_{15}Cl_3NO_2$ requires MNH_4^+, 346.0163).

4.3.17. Phenyl 2-phenylpropanoate (*rac*)-69

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.02 g, 6.80 mmol), DCC (1.57 g, 7.60 mmol) and phenol **38** (0.67 g, 7.12 mmol), gave phenyl 2-phenylpropanoate (*rac*)-**69** (1.16 g, 76%) as colourless cubic crystals; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.21; mp 34–42 °C; ν_{max} ($CHCl_3$) cm^{-1} 1751 (C=O); δ_H (400 MHz; $CDCl_3$) 7.41–7.25 (7H, m, 7 × CH; 2 × Ph), 7.18 (1H, t, *J* 7.2, 1 × CH; Ph), 6.98 (2H, d, *J* 7.2, 2 × CH; Ph), 3.96 (1H, q, *J* 7.2, PhC*H*CH_3) and 1.61 (3H, d, *J* 7.2, PhCHCH_3); δ_C (100 MHz; $CDCl_3$) 173.0 (C=O), 150.9 (*i*-CO; Ph), 140.1 (*i*-CC; Ph), 129.3, 128.8, 127.6, 127.4, 125.8 and 121.4 (6 ×CH; 2 × Ph), 45.7 (PhCHCH$_3$) and 18.6 (PhCHCH_3) (Found MNH_4^+, 244.1322. $C_{15}H_{18}NO_2$ requires MNH_4^+, 244.1332).

4.3.18. Pentachlorophenyl 2-phenylpropanoate (*rac*)-70

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.5 g, 9.99 mmol), DCC (2.27 g, 10.9 mmol) and pentachlorophenol **39** (2.66 g, 9.99 mmol) gave, pentachlorophenyl 2-phenylpropanoate (*rac*)-**70** (1.19 g, 30%) as a white solid; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.5; mp 64–66 °C; ν_{max} (CH_2Cl_2) cm^{-1} 1772 (C=O); δ_H (400 MHz; $CDCl_3$) 7.37–7.28 (4H, m, 4 × CH; Ph), 7.27–7.22 (1H, m, CH; Ph), 4.01 (1H, q, *J* 7.2, PhC*H*CH_3) and 1.61 (3H, d, *J* 7.2, PhCHCH_3); δ_C (100 MHz; $CDCl_3$) 170.2 (C=O), 144.0,[2] 131.8[2] and 131.4[1] (5 × CCl; Ar), 138.4 (*i*-CC; Ph), 128.7,[2] 127.9[2] and 127.8[1] (5 × CH; Ph), 127.7 (*i*-CO; Ar), 45.2 (PhCHCH$_3$) and 18.2 (PhCHCH_3) (Found $M(^{35}Cl)^+$, 395.9035. $C_{15}H_9Cl_5O_2$ requires $M(^{35}Cl)^+$, 395.9040).

4.3.19. Phenylthio 2-phenylpropanoate (*rac*)-71

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.00 g, 6.67 mmol), DCC (1.52 g, 7.37 mmol) and thiophenol **40** (0.73 g, 0.68 mL, 6.63 mmol) gave, phenylthio 2-phenylpropanoate (*rac*)-**71** (1.48 g, 92%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.38; ν_{max} (film) cm^{-1} 1699 (C=O); δ_H (400 MHz; $CDCl_3$) 7.39–7.26 (10H, m, 10 × CH; 2 × Ph), 4.00 (1H, q, *J* 7.2, PhC*H*CH_3) and 1.57 (3H, d, *J* 7.2, PhCHCH_3); δ_C (100 MHz; $CDCl_3$) 199.0 (C=O), 139.6 (*i*-CC; Ph), 134.4, 129.2, 128.7, 128.5, 128.0 and 127.6 (6 × CH; 2 × Ph), 127.7 (*i*-CS; SPh), 54.1 (PhCHCH$_3$) and 18.7 (PhCHCH_3) (Found MNH_4^+, 260.1104. $C_{15}H_{20}NOS$ requires MNH_4^+, 260.1104).

4.3.20. Pentafluorothiophenyl 2-phenylpropanoate (*rac*)-72

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.00 g, 6.69 mmol), DCC (1.53 g, 7.43 mmol) and pentafluorothiophenol **41** (1.34 g, 0.89 mL, 6.70 mmol) gave, pentafluorothiophenyl 2-phenylpropanoate (*rac*)-**72** (1.86 g, 84%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.54; ν_{max} (film) cm^{-1} 1729 (C=O); δ_H (400 MHz; $CDCl_3$) 7.41–7.24 (5H, m, 5 × CH; Ph), 4.04 (1H, q, *J* 7.2, PhC*H*CH_3) and 1.61 (3H, d, *J* 7.2, PhCHCH_3); δ_C (100 MHz; $CDCl_3$) 194.4 (C=O), 146.8 (148.09 and 145.62, 2C, ddt, $^1J_{C,F}$ = 246.4 Hz, $^2J_{C,F}$ = 11.5 Hz and $^3J_{C,F}$ = 4.5 Hz, C(2)-F), 142.6 (143.87 and 141.31, 1C, dtt,

$^1J_{C,F}$ = 256.0 Hz, $^2J_{C,F}$ = 13.7 Hz and $^3J_{C,F}$ = 5.3 Hz), C(4)-F), 138.2 (*i*-CC; Ph), 137.7 (138.99 and 136.45, 2C, dtdd, $^1J_{C,F}$ = 253.6 Hz, $^2J_{C,F}$ = 12.9 Hz, $^3J_{C,F}$ = 4.5 and $^4J_{C,F}$ = 1.5 Hz, C(3)-F), 129.0[1] and 128.2[2] (3 × CH; Ph), 103.3 (1C, tt, , $^3J_{F,F}$ 22.1 and $^4J_{F,F}$ 5.3, *i*-CS; Ar), 54.3 (PhC*H*CH$_3$) and 18.2 (PhCH*C*H$_3$); δ_F (378 MHz; $CDCl_3$) −130.7 (2F, dd, $^3J_{F,F}$ 20.9 and $^4J_{F,F}$ 4.6, F_{ortho}), −149.3 (1F, tt, $^3J_{F,F}$ 20.9 and $^4J_{F,F}$ 4.6, F_{para}) and −160.4 (2F, td, $^3J_{F,F}$ 20.9 and $^4J_{F,F}$ 4.6, F_{meta}) (Found MNH_4^+, 350.0640. $C_{15}H_{13}F_5NOS$ requires MNH_4^+ 350.0638).

4.3.21. 4-Methylphenyl 2-phenylpropanoate (*rac*)-73

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.01 g, 6.69 mmol), DCC (1.54 g, 7.45 mmol) and 4-methylphenol **42** (0.72 g, 6.66 mmol) gave, 4-methylphenyl 2-phenylpropanoate (*rac*)-**73** (1.27 g, 80%) as a white solid; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.30; mp 34–38 °C; ν_{max} (CH_2Cl_2) cm^{-1} 1751 (C=O); δ_H (400 MHz; $CDCl_3$) 7.43–7.35 (4H, m, 4 × CH; Ph), 7.32–7.29 (1H, m, CH; Ph), 7.12 (2H, dt, *J* 8.4 and 2.1, 2 × CH; Ar), 6.87 (2H, dt, *J* 8.4 and 2.1, 2 × CH; Ar), 3.98 (1H, q, *J* 7.2, PhC*H*CH$_3$), 2.32 (3H, s, CH$_3$; Ar) and 1.61 (3H, d, *J* 7.2, PhCHC*H*$_3$); δ_C (100 MHz; $CDCl_3$) 173.2 (C=O), 148.5 (*i*-CO; Ar), 140.1 (*i*-CC; Ph), 135.3 (*i*-CC; Ar), 129.8, 128.7, 127.5, 127.2 and 120.9 (5 × CH; Ar and Ph), 45.9 (PhCHCH$_3$), 20.8 (CH$_3$; Ar), and 18.5 (PhCH*C*H$_3$) (Found MNH_4^+, 285.1486. $C_{16}H_{20}NO_2$ requires MNH_4^+ 258.1489).

4.3.22. 4-Methylthiophenyl 2-phenyl-propanoate (*rac*)-74

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.01 g, 6.71 mmol), DCC (1.72 g, 7.38 mmol) and 4-methylthiophenol **43** (0.83 g, 6.71 mmol) gave, 4-methylthiophenyl 2-phenyl-propanoate (*rac*)-**74** (1.19 g, 69%) as a yellow oil; R_F [light petroleum (40–60 °C)/diethyl ether (8:2)] 0.45; ν_{max} (CH_2Cl_2) cm^{-1} 1735 (C=O); δ_H (400 MHz; $CDCl_3$) 7.39–7.35 (4H, m, 4 × CH; Ph), 7.34–7.29 (1H, m, CH; Ph), 7.25 (2H, dt, *J* 8.2 and 2.1, 2 × CH; Ar), 7.19 (2H, br d, *J* 8.2, 2 × CH; Ar), 4.01 (1H, q, *J* 7.2, PhC*H*CH$_3$), 2.36 (3H, s, CH$_3$; Ar) and 1.58 (3H, d, *J* 7.2, PhCHC*H*$_3$); δ_C (100 MHz; $CDCl_3$) 199.4 (C=O), 139.6 (*i*-CCH$_3$; Ar), 139.5 (*i*-CC; Ph), 134.7[2] and 129.8[2] (4 × CH; Ar), 128.7,[2] 128.0[2] and 127.5[1] (5 × CH; Ph), 124.2 (*i*-CS; Ar), 53.9 (PhCHCH$_3$), 21.3 (CH$_3$; Ar) and 18.7 (PhCH*C*H$_3$) (Found MNH_4^+, 274.1254. $C_{16}H_{20}NOS$ requires MNH_4^+ 274.1260).

4.3.23. 2-Ethylphenyl 2-phenylpropanoate (*rac*)-75

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.41 g, 9.36 mmol), DCC (2.12 g, 10.29 mmol) and 2-ethylphenol **44** (1.14 g, 1.10 ml, 9.36 mmol) gave, 2-ethylphenyl 2-phenylpropanoate (*rac*)-**75** (1.27 g, 53%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (1:1)] 0.82; ν_{max} (CH_2Cl_2) cm^{-1} 1756 (C=O); δ_H (400 MHz; $CDCl_3$) 7.48–7.36 (4H, m, 4 × CH; Ph), 7.34–7.29 (1H, m, CH; Ph), 7.22–7.14 (3H, m, 3 × CH; Ar), 6.94 (1H, br dd, *J* 7.7 and 1.8, CH; Ar), 4.01 (1H, q, *J* 7.1, PhC*H*CH$_3$), 2.29 (1H, q, *J* 7.5, C*H*$_A$H$_B$CH$_3$), 2.28 (1H, q, *J* 7.5, CH$_A$*H*$_B$CH$_3$), 1.67 (3H, d, *J* 7.1, PhCHC*H*$_3$) and 0.97 (3H, t, *J* 7.5, CH$_2$C*H*$_3$); δ_C (100 MHz; $CDCl_3$) 172.9 (C=O), 148.7 (*i*-CO; Ar), 139.9 (*i*-C; Ph), 135.9 (*i*-C; Ar), 129.4, 126.7, 126.0 and 121.9 (4 × CH; Ar), 128.8,[2] 127.6,[2] and 127.3[1] (5 × CH; Ph), 45.6 (PhCH), 23.0 (CH$_2$Ar), 18.1 (CHCH$_3$) and 14.2 (CH$_2$*C*H$_3$) (Found MNH_4^+, 272.1647 $C_{17}H_{22}NO_2$ requires MNH_4^+, 272.1647).

4.3.24. 3-Ethylphenyl 2-phenylpropanoate (*rac*)-76

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.07 g, 7.10 mmol), DCC (1.61 g, 7.81 mmol) and 3-ethylphenol **45** (0.89 g, 0.87 ml, 7.10 mmol) gave, 3-ethylphenyl 2-phenylpropanoate (*rac*)-**76** (1.18 g, 65%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (1:1)] 0.54; ν_{max} (CH_2Cl_2) cm^{-1} 1755 (C=O); δ_H (400 MHz; $CDCl_3$) 7.47–7.38 (4H, m, 4 × CH; Ph), 7.36–7.31 (1H, m, CH; Ph), 7.27 (1H, t, *J* 7.8, CH; Ar), 7.07 (1H, br d, *J* 7.5, CH; Ar), 6.88–6.83 (2H, m, 2 × CH; Ar), 3.97 (1H, q, *J* 7.1, PhC*H*CH$_3$), 2.66 (2H, q, *J* 7.7, C*H*$_2$CH$_3$), 1.63 (3H, d, *J* 7.1, PhCHC*H*$_3$) and 1.23 (3H, t, *J* 7.7, CH$_2$C*H*$_3$); δ_C (100 MHz; $CDCl_3$) 173.3 (C=O), 150.7 (*i*-CO; Ar), 145.8 (*i*-CC; Ar), 140.0 (*i*-C; Ph), 129.1, 125.3, 120.6 and 118.5 (4 × CH; Ar), 128.7,[2] 127.5,[2] and 127.3[1] (5 × CH; Ph), 45.6 (PhCHCH$_3$), 28.5 (*C*H$_2$CH$_3$), 18.5 (PhCHC*H*$_3$) and 15.2 (CH$_2$*C*H$_3$) (Found MNH_4^+, 272.1647 $C_{17}H_{22}NO_2$ requires MNH_4^+, 272.1645).

4.3.25. 4-Ethylphenyl 2-phenylpropanoate (*rac*)-77

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.51 g, 10.0 mmol), DCC (2.28 g, 11.1 mmol) and 4-ethylphenol **46** (1.23 g, 10.0 mmol) gave, 4-ethylphenyl-2-phenylpropanoate (*rac*)-**77** (1.45 g, 57%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (8:2)] 0.53; ν_{max} (CH_2Cl_2) cm^{-1} 1751 (C=O); δ_H (400 MHz; $CDCl_3$) 7.44–7.36 (4H, m, 4 × CH; Ph), 7.35–7.29 (1H, m, CH; Ph), 7.17 (2H, dt, *J* 8.2 and 2.1, 2 × CH; Ar), 6.92 (2H, dt, *J* 8.2 and 2.1, 2 × CH; Ar), 3.97 (1H, q, *J* 7.2, PhC*H*CH$_3$), 2.64 (2H, q, *J* 7.7, CH$_2$Ar), 1.63 (3H, d, *J* 7.2, PhCHC*H*$_3$) and 1.22 (3H, d, *J* 7.7, CH$_2$C*H*$_3$); δ_C (100 MHz; $CDCl_3$) 173.1 (C-O), 148.6 (*i*-CO; Ar), 141.6 (*i*-CC; Ar), 140.1 (*i*-CC; Ph), 128.7,[2] 127.5,[2] and 127.3,[1] (5 × CH; Ph), 128.6[2] and 121.0[2] (4 × CH; Ar), 45.6 (PhCHCH$_3$), 28.1 (CH$_2$), 18.4 (PhCH*C*H$_3$) and 15.6 (*C*H$_3$CH$_2$) (Found MNH_4^+, 272.1644. $C_{17}H_{22}NO_2$ requires MNH_4^+ 272.1645).

4.3.26. 4-Isopropylphenyl 2-phenylpropanoate (*rac*)-78

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.01 g, 6.73 mmol), DCC (1.53 g, 7.40 mmol) and 4-isopropylphenol **47** (0.92 g, 6.73 mmol) gave, 4-isopropylphenyl 2-phenylpropanoate (*rac*)-**78** (1.01 g, 56%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (8:2)] 0.69; ν_{max} (CH_2Cl_2) cm^{-1} 1751 (C=O); δ_H (400 MHz; $CDCl_3$) 7.35–7.28 (4H, m, 4 × CH; Ph), 7.25–7.19 (1H, m, CH; Ph), 7.10 (2H, dt, *J* 8.4 and 2.1, 2 × CH; Ar), 6.83 (2H, dt, *J* 8.4 and 2.1, 2 × CH; Ar), 3.86 (1H, q, *J* 7.2, PhC*H*CH$_3$), 2.81 (1H, septet, *J* 7.0, C*H*(CH$_3$)$_2$), 1.54 (3H, d, *J* 7.2, PhCHC*H*$_3$) and 1.13 (6H, d, *J* 7.0, CH(C*H*$_3$)$_2$); δ_C (100 MHz; $CDCl_3$) 173.2 (C=O), 148.7 (*i*-CO; Ar), 146.3 (*i*-CC; Ar), 140.1 (*i*-CC; Ph), 128.7,[2] 127.5[2] and 127.3[1] (5 × CH; Ph), 127.2[2] and 120.9[2] (4 × CH; Ar), 45.5 (PhCHCH$_3$), 33.5 (*C*H(CH$_3$)$_2$), 24.0 (CH(*C*H$_3$)$_2$) and 18.5 (PhCH*C*H$_3$) (Found MNH_4^+, 286.1800. $C_{18}H_{24}NO_2$ requires MNH_4^+ 286.1802).

4.3.27. 2-Methoxyphenyl 2-phenylpropanoate (*rac*)-79

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (2.01 g, 13.39 mmol), DCC (7.57 g, 36.55 mmol) and 2-methoxyphenol **48** (1.67 g, 6.65 mmol) gave, 2-methoxyphenyl 2-phenylpropanoate (*rac*)-**79** (2.39 g, 70%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (7:3)] 0.5; ν_{max} (film) cm^{-1} 1723 (C=O); δ_H (400 MHz; $CDCl_3$) 7.45 (2H, dt, *J* 7.3 and 1.6, 2 × CH; Ph), 7.38 (2H, tt, *J* 7.3 and 1.6, 2 × CH; Ph), 7.32 (1H, tt, *J* 7.3 and 1.6, CH; Ph), 7.18 (1H, m, CH; Ar), 6.96–6.88 (3H, m, 3 × CH; Ar), 4.01 (1H, q, *J* 7.2, PhC*H*CH$_3$), 3.72 (3H, s, OCH$_3$) and 1.64 (3H, d, *J* 7.2, PhCHC*H*$_3$); δ_C (100 MHz; $CDCl_3$) 172.6 (C=O), 151.1 (*i*-COCH$_3$; Ar), 140.2 (*i*-CO; Ar) and 139.9 (*i*-CC; Ar), 128.5, 127.7 and 127.1 (3 × CH; Ph), 126.7, 122.5, 120.6 and 112.4 (4 × CH; Ar), 55.7 (OCH$_3$), 45.3 (PhCHCH$_3$), 18.7 (PhCH*C*H$_3$) (Found MNH_4^+, 274.1440. $C_{16}H_{20}NO$ requires MNH_4^+, 274.1438).

4.3.28. 4-Methoxyphenyl 2-phenylpropanoate (*rac*)-80

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.01 g, 6.73 mmol), DCC (1.53 g, 7.40 mmol) and 4-methoxyphenol **49** (0.85 g, 6.73 mmol) gave, 4-methoxyphenyl 2-phenylpropanoate (*rac*)-**80** (1.06 g, 62%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (8:2)] 0.34; ν_{max} (CH_2Cl_2) cm^{-1} 1751 (C=O); δ_H (400 MHz; $CDCl_3$) 7.42–7.34 (4H, m, 4 × CH; Ph), 7.32–7.27 (1H, m, CH; Ph), 6.90 (2H, dt, *J* 9.3 and 3.1, 2 × CH;

Ar), 6.82 (2H, dt, *J* 9.3 and 3.1, 2 × CH; Ar), 3.94 (1H, q, *J* 7.2, PhC*H*CH$_3$), 3.76 (3H, s, CH$_3$O; Ar) and 1.59 (3H, d, *J* 7.2, PhCHC*H*$_3$); δ_C (100 MHz; CDCl$_3$) 173.4 (C=O), 157.1 (*i*-CO; Ar), 144.2 (*i*-CO; Ar), 140.1 (*i*-CC; Ph), 128.7,[2] 127.5[2] and 127.2[1] (5 × CH; Ph), 122.0[2] and 114.3[2] (4 × CH; Ar), 55.5 (OCH$_3$), 45.5 (PhCHCH$_3$) and 18.5 (PhCH*C*H$_3$) (Found MNH$_4^+$, 274.1435. $C_{16}H_{20}NO_3$ requires MNH$_4^+$ 274.1438).

4.3.29. 4-Methoxyphenyl 2-phenylpropanoate (*R*)-80

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*R*)-**6** (0.30 g, 2.00 mmol), DCC (0.45 g, 2.20 mmol) and 4-methoxyphenol **48** (0.25 g, 2.00 mmol) gave, 4-methoxyphenyl 2-phenylpropanoate (*R*)-**80** (0.28 g, 55%) as a white solid; R_F [light petroleum (40–60 °C)/diethyl ether (1:1)] 0.49; $[\alpha]_D^{25} = -103.2$ (*c* 0.5, CHCl$_3$); mp 54–56 °C; ν_{max} (CH$_2$Cl$_2$) cm^{-1} 1751 (C=O); δ_H (400 MHz; CDCl$_3$) 7.42–7.34 (4H, m, 4 × CH; Ph), 7.32–7.27 (1H, m, CH; Ph), 6.90 (2H, dt, *J* 9.3 and 3.1, 2 × CH; Ar), 6.82 (2H, dt, *J* 9.3 and 3.1, 2 × CH; Ar), 3.94 (1H, q, *J* 7.2, PhC*H*CH$_3$), 3.76 (3H, s, CH$_3$O; Ar) and 1.59 (3H, d, *J* 7.2, PhCHC*H*$_3$); δ_C (100 MHz; CDCl$_3$) 173.4 (C=O), 157.1 (*i*-CO; Ar), 144.2 (*i*-CO; Ar), 140.1 (*i*-CC; Ph), 128.7,[2] 127.5[2] and 127.2[1] (5 × CH; Ph), 122.0[2] and 114.3[2] (4 × CH; Ar), 55.5 (OCH$_3$), 45.5 (PhCH) and 18.5 (CH*C*H$_3$) (Found MNH$_4^+$, 274.1437. $C_{16}H_{20}NO_3$ requires MNH$_4^+$ 274.1438).

4.3.30. Biphenyl-4-yl 2-phenyl-propanoate (*rac*)-81

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.00 g, 6.67 mmol), DCC (1.51 g, 7.34 mmol) and biphenyl-4-ol **50** (1.14 g, 6.67 mmol) gave, biphenyl-4-yl 2-phenyl-propanoate (*rac*)-**81** (1.29 g, 64%) as a white solid; R_F [light petroleum (40–60 °C)/diethyl ether (8:2)] 0.53; mp 50–52 °C; ν_{max} (CH$_2$Cl$_2$) cm^{-1} 1734 (C=O); δ_H (400 MHz; CDCl$_3$) 7.56–7.52 (4H, m, 4 × CH; Ph^A), 7.45–7.28 (8H, m, CH; Ar, Ph^A and Ph^B), 7.08 (2H, dt, *J* 8.8 and 2.7, 2 × CH; Ar), 3.98 (1H, q, *J* 7.2, PhC*H*CH$_3$) and 1.59 (3H, d, *J* 7.2, PhCHC*H*$_3$); δ_C (100 MHz; CDCl$_3$) 173.1 (C=O), 150.2 (*i*-CO; Ar), 140.3, 140.0 and 138.9 (3 × *i*-CC; Ar, Ph^A, and Ph^B), 128.8,[2] 128.7,[2] 128.0,[2] 127.5,[2] 127.4,[1] 127.3[1] and 127.0[2] (12 × CH; Ph^A, and Ph^B), 121.6[2] (2 × CH; Ar), 45.6 (PhCHCH$_3$) and 18.5 (PhCH*C*H$_3$) (Found MNH$_4^+$, 320.1647. $C_{21}H_{22}NO_2$ requires MNH$_4^+$ 320.1645).

4.3.31. 2,6-Dimethylphenyl 2-phenylpropanoate (*rac*)-82

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.01 g, 6.70 mmol), DCC (1.53 g, 7.42 mmol) and 2,6-dimethylphenol **51** (0.82 g, 6.72 mmol) gave, 2,6-dimethylphenyl 2-phenylpropanoate (*rac*)-**82** (0.73 g, 43%) as colourless cubic crystals; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.39; mp 48–52 °C; ν_{max} (CHCl$_3$) cm^{-1} 3100–2800 (aromatic, CH) and 1751 (C=O); δ_H (400 MHz; CDCl$_3$) 7.46–7.24 (5H, m, 5 × CH; Ph and/or Ar), 6.98 (3H, s, 3 × CH; Ph and/or Ar), 4.02 (1H, q, *J* 7.2, PhC*H*CH$_3$), 1.92 (6H, s, 2 × CH$_3$; Ar) and 1.67 (3H, d, *J* 7.2, PhCHC*H*$_3$); δ_C (100 MHz; CDCl$_3$) 172.1 (C=O), 148.0 (*i*-CO; Ar), 139.9 (*i*-CC; Ph), 130.2, 128.7, 128.5, 127.8, 127.7 and 125.7 (5 × CH; Ph and Ar), 127.5 (*i*-CCH$_3$; Ar), 45.6 (PhCHCH$_3$), 18.1 (PhCHC*H*$_3$) and 16.0 (2 × CH$_3$; Ar) (Found MNH$_4^+$, 272.1644. $C_{17}H_{22}O_2N$ requires MNH$_4^+$, 272.1645).

4.3.32. 2,6-Dimethyl-4-nitrophenylpropanoate (*rac*)-83

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (0.89 g, 5.98 mmol), DCC (1.35 g, 6.58 mmol), DMAP (0.15 g, 1.20 mmol) and 2,6-dimethyl-4-nitrophenol **52** (1.00 g, 5.89 mmol) gave, 2,6-dimethyl-4-nitrophenylpropanoate (*rac*)-**83** (0.87 g, 49%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.50; ν_{max} (CHCl$_3$) cm^{-1} 1723 (OC=O); δ_H (400 MHz; CDCl$_3$) 7.92 (2H, s, 2 × CH; Ar), 7.44–7.25 (5H, m, 5 × CH; Ph), 4.05 (1H, q, *J* 7.2, PhC*H*CH$_3$), 2.08–1.98 (6H, br s, 2 × CH$_3$; Ar), 1.68 (3H, d, *J* 7.2, PhCHC*H*$_3$); δ_C (100 MHz; CDCl$_3$) 171.4 (C=O), 152.9 (*i*-C-N; Ar), 139.1 (*i*-C-O; Ar), 132.3 (*i*-C-CH$_3$; Ar), 128.9[2], 127.8[1] and 127.7[2] (5 × CH; Ph), 123.7[2] (2 × CH; Ar), 45.4 (PhCHCH$_3$), 17.8[2] (2 × CH$_3$; Ar) and 16.2 (PhCHCH$_3$) (Found MNH$_4^+$, 317.1489. $C_{17}H_{21}N_2O_4$ requires MNH$_4^+$, 317.1496).

4.4. General procedure for the mutual kinetic resolutions of active esters (*rac*)-53–83 using oxazolidin-2-one (*rac*)-1 at −78 °C for 2 h

At first, *n*-BuLi (0.44 mL, 2.5 M in hexane, 1.1 mmol) was added to a stirred solution of oxazolidin-2-one (*rac*)-**1** (0.163 g, 1.0 mmol) in THF (5 mL) at −78 °C. After stirring for 1 h, a solution of given active ester (*rac*)-**53–83** (1.1 mmol) in THF (1 mL) was added. The resulting mixture was stirred for 2 h at −78 °C. The reaction was quenched with water (10 mL). The organic layer was extracted with diethyl ether (2 × 10 mL), dried (over MgSO$_4$) and evaporated under reduced pressure to give a separable mixture of two diastereoisomeric oxazolidin-2-ones *syn*- and *anti*-**4**. The crude mixture was purified by flash column chromatography on silica gel eluting with light petroleum (bp 40–60 °C)/diethyl ether (7:3) to give the oxazolidin-2-ones *syn*- and *anti*-**4** as white needle-like crystals.

Active ester (*rac*)-**53**, gave a mixture (95:5) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.115 g, 39%).

Active ester (*rac*)-**54**, gave a mixture (98:2) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.106 g, 36%).

Active ester (*rac*)-**55**, gave a mixture (96:4) of oxazolidin-2-ones *syn*- and *anti*-**4** (89 mg, 30%).

Active ester (*rac*)-**56**, gave a mixture (98:2) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.165 g, 56%).

Active ester (*rac*)-**57**, gave a mixture (98:2) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.197 g, 67%).

Active ester (*rac*)-**58**, gave a mixture (95:5) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.115 g, 39%).

Active ester (*rac*)-**59**, gave a mixture (95:5) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.114 g, 39%).

Active ester (*rac*)-**60**, gave a mixture (95:5) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.100 g, 34%).

Active ester (*rac*)-**61**, gave a mixture (98:2) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.132 g, 45%).

Active ester (*rac*)-**62**, gave a mixture (98:2) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.144 g, 49%).

Active ester (*rac*)-**63**, gave a mixture (93:7) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.123 g, 42%).

Active ester (*rac*)-**64**, gave a mixture (69:31) of oxazolidin-2-ones *syn*- and *anti*-**4** (59 mg, 20%).

Active ester (*rac*)-**65**, gave a mixture (98:2) of oxazolidin-2-ones *syn*- and *anti*-**4** (86 mg, 29%).

Active ester (*rac*)-**66**, gave a mixture (86:14) of oxazolidin-2-ones *syn*- and *anti*-**4** (94 mg, 32%).

Active ester (*rac*)-**67**, gave a mixture (87:13) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.121 g, 41%).

Active ester (*rac*)-**68**, gave a mixture (55:45) of oxazolidin-2-ones *syn*- and *anti*-**4** (59 mg, 20%).

Active ester (*rac*)-**69**, gave recovered stating materials.

Active ester (*rac*)-**15**, gave a mixture (97:3) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.206 g, 70%).

Active ester (*rac*)-**70**, gave a mixture (83:17) of oxazolidin-2-ones *syn*- and *anti*-**4** (59 mg, 20%).

Active ester (*rac*)-**71**, gave a mixture (95:5) of oxazolidin-2-ones *syn*- and *anti*-**4** (62 mg, 21%).

Active ester (*rac*)-**72**, gave a mixture (95:5) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.109 g, 37%).

Active ester (*rac*)-**73**, gave recovered stating materials.

Active ester (*rac*)-**74**, gave a mixture (95:5) of oxazolidin-2-ones *syn*- and *anti*-**4** (86 mg, 29%).

Active ester (*rac*)-**75**, gave a mixture (69:39) of oxazolidin-2-ones *syn*- and *anti*-**4** (24 mg, 8%).

Active ester (*rac*)-**76**, gave recovered stating materials.

Active ester (*rac*)-**77**, gave recovered stating materials.

Active ester (*rac*)-**78**, gave recovered stating materials.

Active ester (*rac*)-**79**, gave a mixture (63:37) of oxazolidin-2-ones *syn*- and *anti*-**4** (50 mg, 17%).

Active ester (*rac*)-**80**, gave recovered stating materials.

Active ester (*rac*)-**81**, gave a mixture (90:10) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.165 g, 56%).

Active ester (*rac*)-**82**, gave recovered stating materials.

Active ester (*rac*)-**83**, gave recovered stating materials.

4.5. General procedure for the mutual kinetic resolutions of active esters (*rac*)-15, (*rac*)-69, (*rac*)-73, (*rac*)-75–80 and (*rac*)-82–83 using oxazolidin-2-one (*rac*)-1 at −78 °C (2 h)→rt (for 10 h)

At first, *n*-BuLi (0.44 ml, 2.5 M in hexane, 1.1 mmol) was added to a stirred solution of oxazolidin-2-one (*rac*)-**1** (0.163 g, 1.0 mmol) in THF (5 ml) at −78 °C. After stirring for 1 h, a solution of given active ester (*rac*)-**15**, (*rac*)-**69**, (*rac*)-**73**, (*rac*)-**75–80** and (*rac*)-**82–83** (1.1 mmol) in THF (1 ml) was added. The resulting mixture was stirred for 2 h at −78 °C, then allowed to warm up to room temperature. The resulting solution was stirred for 10 h. The reaction was quenched with water (10 mL). The organic layer was extracted with diethyl ether (2 × 10 mL), dried (over $MgSO_4$) and evaporated under reduced pressure to give a separable mixture of two diastereoisomeric oxazolidin-2-ones *syn*- and *anti*-**4**. The crude mixture was purified by flash column chromatography on silica gel eluting with light petroleum (bp 40–60 °C)/diethyl ether (7:3) to give the oxazolidin-2-ones *syn*- and *anti*-**4** as white needle-like crystals.

Active ester (*rac*)-**15**, gave a mixture (96:4) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.115 g, 62%).

Active ester (*rac*)-**68**, gave a mixture (40:60) of oxazolidin-2-ones *syn*- and *anti*-**4** (62 mg, 21%).

Active ester (*rac*)-**73**, gave a mixture (28:72) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.141 g, 48%).

Active ester (*rac*)-**75**, gave a mixture (31:69) of oxazolidin-2-ones *syn*- and *anti*-**4** (63 mg, 21%).

Active ester (*rac*)-**76**, gave a mixture (42:58) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.127 g, 43%).

Active ester (*rac*)-**77**, gave a mixture (18:82) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.100 g, 34%).

Active ester (*rac*)-**78**, gave a mixture (17:83) of oxazolidin-2-ones *syn*- and *anti*-**4** (80 mg, 27%).

Active ester (*rac*)-**79**, gave a mixture (37:63) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.113 g, 38%).

Active ester (*rac*)-**80**, gave a mixture (24:76) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.153 g, 52%).

Active ester (*rac*)-**82**, gave recovered stating materials.

Active ester (*rac*)-**83**, gave recovered stating materials.

4.5.1. Stereospecific formation of oxazolidin-2-one (*S*,*R*)-*syn*-4

n-BuLi (0.44 mL, 2.5 M in hexane, 1.1 mmol) was added to a stirred solution of oxazolidin-2-one (*R*)-**1** (0.163 g, 1.0 mmol) in THF (5 mL) at −78 °C. After stirring for 1 h, a solution of given active ester (*S*)-**15** (1.0 mmol) in THF (1 mL) was added. The resulting mixture was stirred for 2 h at −78 °C. The reaction was quenched with water (10 mL). The organic layer was extracted with diethyl ether (2 × 10 mL), dried (over $MgSO_4$) and evaporated under reduced pressure to give a single diastereoisomeric oxazolidin-2-one (*S*,*R*)-*syn*-**4**. The crude mixture was purified by flash column chromatography on silica gel eluting with light petroleum (bp 40–60 °C)/diethyl ether (7:3) to give the oxazolidin-2-one (*S*,*R*)-*syn*-**4** (0.177 g, 60%) as a colourless oil; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.43; ν_{max} (film) cm^{-1} 1774 (OC=O) and 1701 (NC=O); $[\alpha]_D^{25} = +128.9$ (*c* 3.5, $CHCl_3$) (Found MH^+ 262.1434; $C_{15}H_{20}NO_3^+$ requires 262.1443).

4.5.2. Stereospecific formation of oxazolidin-2-one (*R*,*R*)-*anti*-4

At first, *n*-BuLi (0.44 mL, 2.5 M in hexane, 1.1 mmol) was added to a stirred solution of oxazolidin-2-one (*R*)-**1** (0.163 g, 1.0 mmol) in THF (5 mL) at −78 °C. After stirring for 1 h, a solution of the given active ester (*R*)-**15** (1.0 mmol) in THF (1 mL) was added. The resulting mixture was stirred for 2 h at −78 °C. The reaction was quenched with water (10 mL). The organic layer was extracted with diethyl ether (2 × 10 mL), dried (over $MgSO_4$) and evaporated under reduced pressure to give a single diastereoisomeric oxazolidin-2-one (*R*,*R*)-*anti*-**4**. The crude mixture was purified by flash column chromatography on silica gel eluting with light petroleum (bp 40–60 °C)/diethyl ether (7:3) to give the oxazolidin-2-one (*R*,*R*)-*anti*-**4** (0.171 g, 58%) as a colourless oil; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.64; ν_{max} ($CHCl_3$) cm^{-1} 1774 (OC=O) and 1703 (NC=O); $[\alpha]_D^{25} = -19.8$ (*c* 3.3, $CHCl_3$) {lit. $[\alpha]_D^{25} = -19.2$ (*c* 1.15, $CHCl_3$)} (Found MH^+ 262.1432; $C_{15}H_{20}NO_3^+$ requires 262.1443).

4.6. General procedure for probing the mutual kinetic resolutions of active ester (*rac*)-15 and oxazolidin-2-one (*rac*)-1 using different additives and metal amides at −78 °C (for 2 h)

At first, *n*-BuLi/LDA/LiHMDS/NaHMDS/KHMDS (1.1 mmol) was added to a stirred solution of oxazolidin-2-one (*rac*)-**1** (0.163 g, 1.0 mmol) with and without HMPA/crown ether (1.1 mmol) in THF (5 mL) at −78 °C. After stirring for 1 h, a solution of given active ester (*rac*)-**15** (0.347 g, 1.1 mmol) in THF (1 mL) was added. The resulting mixture was stirred for 2 h at −78 °C. The reaction was quenched with water (10 mL). The organic layer was extracted with diethyl ether (2 × 10 mL), dried (over $MgSO_4$) and evaporated under reduced pressure to give a separable mixture of two diastereoisomeric oxazolidin-2-ones *syn*- and *anti*-**4**. The crude mixture was purified by flash column chromatography on silica gel eluting with light petroleum (bp 40–60 °C)/diethyl ether (7:3) to give the oxazolidin-2-ones *syn*- and *anti*-**4** as white needle-like crystals.

Using *n*-BuLi (0.44 mL, 2.5 M in hexanes, 1.1 mmol) and 12-crown-4 (0.19 g, 1.1 mmol) gave a mixture (97:3) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.174 g, 59%).

Using *n*-BuLi (0.44 mL, 2.5 M in hexanes, 1.1 mmol) and HMPA (0.59 g, 0.57 mL, 3.3 mmol) gave a mixture (91:9) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.191 g, 65%).

Using LDA (0.55 mL, 2 M in THF, 1.1 mmol) gave a mixture (97:3) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.123 g, 42%).

Using LDA (0.55 mL, 2 M in THF, 1.1 mmol) and 12-crown-4 (0.19 g, 1.1 mmol) gave a mixture (97:3) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.190 g, 65%).

Using LiHMDS (1.1 mL, 1 M in THF, 1.1 mmol) gave a mixture (96:4) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.165 g, 56%).

Using LiHMDS (1.1 mL, 1 M in THF, 1.1 mmol) and 12-crown-4 (0.19 g, 1.1 mmol) gave a mixture (97:3) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.185 g, 63%).

Using NaHMDS (1.1 mL, 1 M in THF, 1.1 mmol) gave a mixture (96:4) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.168 g, 57%).

Using NaHMDS (1.1 mL, 1 M in THF, 1.1 mmol) and 15-crown-5 (0.24 g, 0.21 mL, 1.1 mmol) gave a mixture (97:3) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.224 g, 76%).

Using KHMDS (2.2 mL, 0.5 M in toluene, 1.1 mmol) gave a mixture (84:16) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.129 g, 44%).

Using KHMDS (2.2 mL, 0.5 M in toluene, 1.1 mmol) and 18-crown-8 (0.29 g, 1.1 mmol) gave a mixture (76:26) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.227 g, 77%).

Using MeMgBr (0.55 mL, 2 M in diethyl ether, 1.1 mmol) a mixture (80:20) of oxazolidin-2-ones *syn*- and *anti*-**4** (29 mg, 10%).

4.7. General procedure for probing the mutual kinetic resolutions of active ester (*rac*)-15 and oxazolidin-2-one (*rac*)-1 at different temperatures and reaction times

At first, *n*-BuLi (0.44 mL, 2.5 M in hexanes, 1.1 mmol) was added to a stirred solution of oxazolidin-2-one (*rac*)-**1** (0.163 g, 1.0 mmol) in THF (5 mL) at the chosen temperature *n* °C. After stirring for 1 h, a solution of given active ester (*rac*)-**15** (0.347 g, 1.1 mmol) in THF (1 mL) (at the same *n* °C) was added. The resulting mixture was stirred for 2 h at *n* °C. The reaction was quenched with water (10 mL). The organic layer was extracted with diethyl ether (2 × 10 mL), dried (over $MgSO_4$) and evaporated under reduced pressure to give a separable mixture of two diastereoisomeric oxazolidin-2-ones *syn*- and *anti*-**4**. The crude mixture was purified by flash column chromatography on silica gel eluting with light petroleum (bp 40–60 °C)/diethyl ether (7:3) to give the oxazolidin-2-ones *syn*- and *anti*-**4** as white needle-like crystals.

At −78 °C for 2 h, gave a mixture (97:3) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.206 g, 70%), and the active ester (*rac*)-**15** (41 mg, 12%).

At −78 °C for 5 min, gave a mixture (97:3) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.116 g, 39%), and the active ester (*rac*)-**15** (0.109 g, 37%).

At −50 °C for 2 h, gave a mixture (96:4) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.179 g, 61%).

At 0 °C for 2 h, gave a mixture (96:4) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.182 g, 62%).

At +25 °C for 2 h, gave a mixture (95:5) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.156 g, 53%).

At +50 °C for 2 h, gave a mixture (80:20) of oxazolidin-2-ones *syn*- and *anti*-**4** (0.132 g, 45%).

4.8. General procedure for probing the kinetic resolutions of different amounts of active ester (*rac*)-15 and oxazolidin-2-one (*S*)-1 at −78 °C

At first, *n*-BuLi (0.44 mL, 2.5 M in hexanes, 1.1 mmol) was added to a stirred solution of oxazolidin-2-one (*S*)-**1** (0.163 g, 1.0 mmol) in THF (5 mL) at −78 °C. After stirring for 1 h, a solution of given active ester (*rac*)-**15** (0.315 g, per 1 mmol) in THF (1 mL per 1 mmol) was added. The resulting mixture was stirred for *n* h at −78 °C. The reaction was quenched with water (10 mL). The organic layer was extracted with diethyl ether (2 × 10 mL), dried (over $MgSO_4$) and evaporated under reduced pressure to give a separable mixture of two diastereoisomeric oxazolidin-2-ones *syn*- and *anti*-**4**. The crude mixture was purified by flash column chromatography on silica gel eluting with light petroleum (bp 40–60 °C)/diethyl ether (7:3) to give the enantiomerically pure oxazolidin-2-ones (*R*,*S*)-*syn*- and (*S*,*S*)-*anti*-**4** as white needle-like crystals.

At −78 °C, using 2 equiv of (*rac*)-**15** for 5 min, gave a mixture (97:3) of oxazolidin-2-ones (*R*,*S*)-*syn*- and (*S*,*S*)-*anti*-**4** (0.168 g, 57%).

At −78 °C, using 1 equiv of (*rac*)-**15** for 5 min, gave a mixture (97:3) of oxazolidin-2-ones (*R*,*S*)-*syn*- and (*S*,*S*)-*anti*-**4** (0.116 g, 39%).

At −78 °C, using 0.5 equiv of (*rac*)-**15** for 5 min, gave a mixture (97:3) of oxazolidin-2-ones (*R*,*S*)-*syn*- and (*S*,*S*)-*anti*-**4** (21 mg, 7%).

At −78 °C, using 0.25 equiv of (*rac*)-**15** for 5 min, gave a mixture (97:3) of oxazolidin-2-ones (*R*,*S*)-*syn*- and (*S*,*S*)-*anti*-**4** (9 mg, 3%).

At −78 °C, using 1 equiv of (*rac*)-**15** for 10 min, gave a mixture (93:17) of oxazolidin-2-ones (*R*,*S*)-*syn*- and (*S*,*S*)-*anti*-**4** (0.100 g, 34%).

At −78 °C, using 1 equiv of (*rac*)-**15** for 20 min, gave a mixture (86:14) of oxazolidin-2-ones (*R*,*S*)-*syn*- and (*S*,*S*)-*anti*-**4** (89 mg, 30%).

At −78 °C, using 1 equiv of (*rac*)-**15** for 2 h, gave a mixture (72:28) of oxazolidin-2-ones (*R*,*S*)-*syn*- and (*S*,*S*)-*anti*-**4** (0.100 g, 34%).

At −78 °C, using 2 equiv of (*rac*)-**15** for 2 h, gave a mixture (94:6) of oxazolidin-2-ones (*R*,*S*)-*syn*- and (*S*,*S*)-*anti*-**4** (0.179 g, 61%).

4.8.1. Synthesis of 2,4-dichlorophenyl 2-(4-isobutylphenyl)propanoate (*rac*)-84

In the same way as the active ester (*rac*)-**14**, 2-(4-isobutylphenyl)propanoic acid (*rac*)- (1.0 g, 4.87 mmol), DCC (1.10 g, 5.35 mmol) and 2,4-dichlorophenol **31** (0.79 g, 4.87 mmol) gave, 2,4-dichlorophenyl 2-(4-isobutylphenyl)propanoate (*rac*)-**84** (1.28 g, 75%) as a colourless oil; R_F [light petroleum (40–60 °C)/diethyl ether (9:1)] 0.40; ν_{max} (film) cm^{-1} 1760 (C=O); δ_H (400 MHz; $CDCl_3$) 7.41 (1H, d, *J* 2.5, CH; $C_6H_3Cl_2$), 7.33 (2H, br d, *J* 8.1, 2 × CH; Ar), 7.18 (1H, dd, *J* 8.6 and 2.5, CH; $C_6H_3Cl_2$), 7.16 (2H, br d, *J* 8.1, 2 × CH; Ar), 6.98 (1H, d, *J* 8.6, CH; $C_6H_3Cl_2$), 4.03 (1H, q, *J* 7.2, ArC*H*CH_3), 2.50 (2H, br d, *J* 7.2, $ArCH_2$), 1.90 (1H, m, C*H*$(CH_3)_2$), 1.67 (3H, d, *J* 7.2, ArCHC*H*$_3$) and 0.93 (6H, br d, *J* ~6.7, 2 × CH_3, $CH(CH_3)_2$); δ_C (100 MHz; $CDCl_3$) 172.4 (C=O), 146.2 (*i*-CCl; $C_6H_3Cl_2$), 141.4 (*i*-CO; $C_6H_3Cl_2$), 137.0 (*i*-CCl; $C_6H_3Cl_2$), 132.1 (*i*-CC; Ar), 130.4 (CH; $C_6H_3Cl_2$), 130.1[2] (2C, 2 × CH; Ar), 128.3 (*i*-CC; Ar), 127.8[2] (2C, 2 × CH; Ar), 124.9 (CH; $C_6H_3Cl_2$), 45.5 (ArCHCH$_3$ and C*H*$(CH_3)_2$), 32.0 ($ArCH_2$), 22.8[2] (2 × CH_3; $CH(CH_3)_2$) and 18.8 (ArCH*C*H$_3$) (Found M(^{35}Cl)$^+$, 294.0209. $C_{15}H_{12}Cl_2O_2$ requires M^+ 294.0209).

4.8.2. Synthesis of pentafluorophentyl 2-(4-isobutylphenyl)propanoate (*rac*)-86

In the same way as the active ester (*rac*)-**14**, 2-phenylpropanoic acid (*rac*)-**6** (1.0 g, 4.87 mmol), DCC (1.10 g, 5.35 mmol) and pentafluorophenol **8** (0.89 g, 4.85 mmol) gave, pentafluorophenyl 2-(4-isobutylphenyl)propanoate (*rac*)-**86** (1.48 g, 82%) as a white needle-like solid; mp 48–49 °C; R_F [light petroleum (40–60 °C)/ether (9:1)] 0.63; ν_{max} ($CHCl_3$) cm^{-1} 1782 (CO); δ_H (400 MHz; $CDCl_3$) 7.26 (2H, dt, *J* 8.2 and 2.2, 2 × CH; Ar), 7.14 (2H, dt, *J* 8.2 and 2.2, 2 × CH; Ar), 4.04 (1H, q, *J* 7.2, ArC*H*CH_3), 2.46 (2H, d, *J* 7.2, $ArCH_2$), 1.92–1.80 (1H, m, C*H*$(CH_3)_2$), 1.62 (3H, d, *J* 7.2, ArCHC*H*$_3$), 0.99 (3H, d, *J* 6.7, $CH_3^ACHCH_3^B$) and 0.88 (3H, d, *J* 6.7, $CH_3^BCHCH_3^A$); δ_C (100 MHz; $CDCl_3$) 170.3 (OC=O), 140.8 (*i*-C; Ar), 141.2 (142.92 and 139.42, 2C, ddt, $^1J_{C,F}$ = 251.3 Hz, $^2J_{C,F}$ = 11.9 Hz and $^3J_{C,F}$ = 4.2 Hz, C(2)-F), 138.9 (140.18 and 137.66, 1C, dtt, $^1J_{C,F}$ = 253.2 Hz, $^2J_{C,F}$ = 13.8 Hz and $^3J_{C,F}$ = 3.8 Hz), C(4)-F), 137.3 (138.61 and 136.08, 2C, dtdd, $^1J_{C,F}$ = 254.7 Hz, $^2J_{C,F}$ = 14.5 Hz, $^3J_{C,F}$ = 5.3 and $^4J_{C,F}$ = 3.0 Hz, C(3)-F), 135.5 (*i*-C; Ar), 129.1 and 126.7 (2 × CH; Ar), 124.7 (1C, tdt, $^2J_{C,F}$ = 14.2 Hz, $^4J_{C,F}$ = 4.6 Hz and $^3J_{C,F}$ = 2.3 Hz, *i*-CO; OC_6F_5), 44.5 (CH_2; Ar), 44.4 (ArCHCH$_3$), 29.7 ($CH(CH_3)_2$), 21.9 ($CH(CH_3)_2$) and 18.0 (ArCHCH_3) (Found M, 372.1144; $C_{19}H_{17}F_5O_2$ requires 372.1143).

4.9. Procedure for probing the mutual kinetic resolutions of active esters (*rac*)-15 and (*rac*)-84 using oxazolidin-2-one (*rac*)-1

At first, *n*-BuLi (0.44 mL, 2.5 M in hexanes, 1.1 mmol) was added to a stirred solution of oxazolidin-2-one (*rac*)-**1** (0.163 g, 1.0 mmol) in THF (5 mL) at the chosen temperature −78 °C. After stirring for 1 h, a solution of active esters (*rac*)-**15** (0.347 g, 1.1 mmol) and (*rac*)-**84** (0.386 g, 1.1 mmol) in THF (1 mL) was added. The resulting mixture was stirred for 2 h. The reaction was quenched with water (10 mL). The organic layer was extracted with diethyl ether (2 × 10 mL), dried (over $MgSO_4$) and evaporated under reduced pressure to give a mixture of two diastereoisomeric oxazolidin-2-ones adducts (*rac*)-*syn*- and (*rac*)-*anti*-**4**, and (*rac*)-*syn*- and (*rac*)-*anti*-**85** (0.18 g, 60%; ratio 89:11) with a diastereoisomeric excess of 94%.

Characterisation data for: 3-[2-(4-isobutylphenyl)propanoyl]-4-phenyloxazolidin-2-one (*rac*)-*anti*-**85**; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.62; ν_{max} ($CHCl_3$) cm^{-1} 1780 (OC=O) and 1701 (NC=O); mp 150–154 °C; δ_H (400 MHz; $CDCl_3$) 7.39–7.23 (7H, m, 7 × CH; Ar and Ph), 7.07 (2H, dt, *J* 8.2 and 2.1, 2 × CH; Ar), 5.33 (1H, dd, *J* 8.4 and 3.2, PhCHN), 5.10 (1H, q, *J* 7.1, ArC*H*CH_3), 4.55 (1H, t, *J* 8.9, C$H_A$$H_B$O), 4.20 (1H, dd *J* 8.9 and 3.2, CH_AH_BO), 2.42 (2H, d, *J* 7.2, $ArCH_2$), 1.88–1.78 (1H, m, C*H*$(CH_3)_2$), 1.39 (3H, d, *J* 7.1, ArCHC*H*$_3$), 0.89 (3H, d, *J* 6.7, CH_3^ACHCH_3^B) and 0.88 (3H, d, *J* 6.7, CH_3^ACHCH_3^B); δ_C(100.6 MHz; $CDCl_3$) 173.9 (NC=O), 153.2 (OC=O), 140.6 (*i*-C; Ar), 138.3 (*i*-C; Ar), 137.0 (*i*-C; Ph), 129.3[2] and 128.0[2] (4 × CH; Ar), 128.8,[2] 128.5[1] and 125.8[2] (5 × CH; Ph), 69.6 (CH_2O), 57.8 (PhCHN), 45.1 (*C*H$(CH_3)_2$), 43.3 (Ar*C*HCH_3), 30.2 ($ArCH_2$), 22.4 (2C, CH(*C*$H_3)_2$) and 18.5 (ArCHCH_3) (Found MH^+, 352.1913; $C_{22}H_{26}NO_3$ requires MH^+, 352.1907); and 3-[2-(4-isobutylphenyl)propanoyl]-4-phenyloxazolidin-2-one (*rac*)-*syn*-**85** as a white crystalline solid; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.41; ν_{max} ($CHCl_3$) cm^{-1} 1779 (OC=O) and 1705 (NC=O); mp 67–71 °C; δ_H (400 MHz; $CDCl_3$) 7.28–7.15 (3H, m, 3 × CH; Ph and/or Ar), 7.03–7.00 (4H, m, 4 × CH; Ph and Ar), 6.90 (2H, dt, *J* 7.9 and 2.1, 2 × CH; Ar), 5.44 (1H, dd *J* 9.2 and 5.2, PhCHN), 5.09 (1H, q, *J* 6.9; ArC*H*CH_3), 4.63 (1H, t, *J* 9.0, C$H_A$$H_B$O), 4.06 (1H, dd, *J* 9.0 and 5.2, CH_AH_BO), 2.43 (2H, d, *J* 7.4, $ArCH_2$), 1.89–1.79 (1H, m, C*H*$(CH_3)_2$), 1.38 (3H, d, *J* 6.9, ArCHCH_3), 0.91 (3H, d, *J* 6.7, CH_3^ACHCH_3^B) and 0.91 (3H, d, *J* 6.7, CH_3^ACHCH_3^B); δ_C (100.6 MHz; $CDCl_3$) 174.3 (NC=O), 153.3 (OC=O), 140.7 (*i*-C; Ar), 139.4 (*i*-C; Ar), 137.4 (*i*-C; Ph), 129.3[2] and 127.0[2] (4 × CH; Ar), 129.2,[2] 128.7[1] and 125.8[2] (5 × CH; Ph), 69.7 (CH_2O), 58.1 (PhCHN), 45.1 (*C*H$(CH_3)_2$), 42.7 (Ar*C*HCH_3), 30.2 ($ArCH_2$), 22.4 (2C, CH(*C*$H_3)_2$) and 19.4 (ArCHCH_3) (Found MH^+, 352.1909; $C_{22}H_{26}NO_3$ requires MH^+, 352.1907).

4.10. Procedure for probing the mutual kinetic resolutions of active esters (*rac*)-62 and (*rac*)-86 using oxazolidin-2-one (*rac*)-1

At first, *n*-BuLi (0.44 mL, 2.5 M in hexanes, 1.1 mmol) was added to a stirred solution of oxazolidin-2-one (*rac*)-**1** (0.163 g, 1.0 mmol) in THF (5 mL) at the chosen temperature −78 °C. After stirring for 1 h, a solution of active esters (*rac*)-**62** (0.323 g, 1.1 mmol) and (*rac*)-**86** (0.409 g, 1.1 mmol) in THF (1 mL) was added. The resulting mixture was stirred for 2 h. The reaction was quenched with water (10 mL). The organic layer was extracted with diethyl ether (2 × 10 mL), dried (over $MgSO_4$) and evaporated under reduced pressure to give a mixture of two diastereoisomeric oxazolidin-2-ones adducts (*rac*)-*syn*- and (*rac*)-*anti*-**4**, and (*rac*)-*syn*- and (*rac*)-*anti*-**85** (0.174 g, 58%; ratio 13:87) with a diastereoisomeric excess of 94%.

4.11. Procedure for probing the mutual kinetic resolution of active ester (*rac*)-15 using oxazolidin-2-one (*rac*)-1 and oxazolidin-2-thione (*rac*)-87

At first, *n*-BuLi (0.44 mL, 2.5 M in hexanes, 1.1 mmol) was added to a stirred solution of oxazolidin-2-one (*rac*)-**1** (81 mg, 0.5 mmol) and oxazolidin-2-thione (*rac*)-**87** (89 mg, 0.5 mmol) in THF (5 mL) at the chosen temperature −78 °C. After stirring for 1 h, a solution of active ester (*rac*)-**15** (0.347 g, 1.1 mmol) in THF (1 mL) was added. The resulting mixture was stirred for 2 h. The reaction was quenched with water (10 mL). The organic layer was extracted with diethyl ether (2 × 10 mL), dried (over $MgSO_4$) and evaporated under reduced pressure to give a separable mixture of two diastereoisomeric oxazolidin-2-ones adducts (*rac*)-*syn*- and (*rac*)-*anti*-**4** (93 mg, 63%) with 98% de; and (*rac*)-*syn*- and (*rac*)-*anti*-**88** (63 mg, 40%) with 96% de.

Characterisation data for: 3-(2-phenylpropanoyl)-4-phenyloxazolidin-2-thione (*rac*)-*syn*-**88**; white solid; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether: (1:1)] 0.67; mp 118–119 °C; ν_{max} ($CHCl_3$) cm^{-1} 1700 (C=S); δ_H (400 MHz; $CDCl_3$) 7.20–7.08 (6H, m, 6 × CH; Ph^A and Ph^B), 6.94 (2H, dt, *J* 6.9 and 1.8, 2 × CH; Ph^A), 6.88 (2H, dt, *J* 7.0 and 1.8, 2 × CH; Ph^B), 5.98 (1H, q, *J* 6.9, PhC*H*CH_3), 5.61 (1H, dd, *J* 9.2 and 6.1, CHN), 4.68 (1H, t, *J* 9.2, C$H_A$$H_B$O), 4.20 (1H, dd, *J* 9.2 and 6.1, CH_AH_BO) and 1.35 (3H, d, *J* 6.9, PhCHCH_3), δ_C (100 MHz; $CDCl_3$) 185.2 (C=S), 174.8 (C=O), 139.1 and 136.9 (2 × *i*-C; 2 × Ph), 128.8,[2] 128.7,[1] 128.5,[2] 128.3,[2] 127.1[1] and 126.4[2] (10 × CH; 2 × Ph), 73.6 (CH_2O), 62.6 (CHN), 43.9 (PhCHCH$_3$) and 18.7 (PhCHCH_3) (Found MH^+, 312.1054; $C_{18}H_{17}NO_2S$ requires 312.1053).

At −78 °C, using 2 equiv of (*rac*)-**15** for 5 min, gave a diastereoisomeric mixture of oxazolidin-2-ones (*rac*)-*syn*- and (*rac*)-*anti*-**4** (50 mg, 34%) with 86% de; and oxazolidin-2-thiones (*rac*)-*syn*- and (*rac*)-*anti*-**88** (14 mg, 9%) with 84% de.

4.12. Procedure for probing the parallel kinetic resolution of active ester (*rac*)-15 using oxazolidin-2-one (*R*)-1 and oxazolidin-2-thione (*S*)-87

At first, *n*-BuLi (0.44 mL, 2.5 M in hexanes, 1.1 mmol) was added to a stirred solution of oxazolidin-2-one (*R*)-**1** (81 mg, 0.5 mmol) and oxazolidin-2-thione (*S*)-**87** (89 mg, 0.5 mmol) in THF (5 mL) at the chosen temperature −78 °C. After stirring for 1 h, a solution of active ester (*rac*)-**15** (0.347 g, 1.1 mmol) in THF (1 mL) was added. The resulting mixture was stirred for 2 h. The reaction was quenched with water (10 mL). The organic layer was extracted with diethyl ether (2 × 10 mL), dried (over $MgSO_4$) and evaporated under reduced pressure to give a separable mixture of two diastereoisomeric oxazolidin-2-ones adducts (*S*,*R*)-*syn*- and (*R*,*R*)-*anti*-**4** (75 mg, 51%) with 92% de; and (*R*,*S*)-*syn*- and (*S*,*S*)-*anti*-**88** (37 mg, 24%) with 96% de.

Characterisation data for: 3-(2-phenylpropanoyl)-4-phenyloxazolidin-2-thione (*R*,*S*)-*syn*-**88**; white solid; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether: (1:1)] 0.67; mp 87–89 °C [lit.[15] (*S*,*R*)- 84–86 °C]; $[\alpha]_D^{25} = +66.1$ (*c* 3.6, $CHCl_3$) [lit.[15] (*S*,*R*)- $[\alpha]_D^{25} = -58.3$ (*c* 4.0, $CHCl_3$)]; ν_{max} ($CHCl_3$) cm^{-1} 1708 (C=O) and 1216 (C=S); δ_H (400 MHz; $CDCl_3$) 7.20–7.08 (6H, m, 6 × CH; Ph^A and Ph^B), 6.94 (2H, dt, *J* 6.9 and 1.8, 2 × CH; Ph^A), 6.88 (2H, dt, *J* 7.0 and 1.8, 2 × CH; Ph^B), 5.98 (1H, q, *J* 6.9, PhC*H*CH_3), 5.62 (1H, dd, *J* 9.2 and 6.1, PhCHN), 4.68 (1H, t, *J* 9.2, C$H_A$$H_B$O), 4.20 (1H, dd, *J* 9.2 and 6.1, CH_AH_BO) and 1.35 (3H, d, *J* 6.9, PhCHCH_3), δ_C (100 MHz; $CDCl_3$) 185.2 (C=S), 174.8 (C=O), 139.1 and 136.9 (2 × *i*-C; 2 × Ph), 128.8,[2] 128.7,[1] 128.5,[2] 128.3,[2] 127.1[1] and 126.4[2] (10 × CH; 2 × Ph), 73.6 (CH_2O), 62.6 (PhCHN), 43.9 (PhCHCH$_3$) and 18.7 (PhCHCH_3) (Found MH^+, 312.1054; $C_{18}H_{18}NO_2S$ requires MH^+, 312.1053).

At −78 °C, using 2 equiv of (*rac*)-**15** for 5 min, gave a diastereoisomeric mixture of oxazolidin-2-ones (*S*,*R*)-*syn*- and (*R*,*R*)-*anti*-**4** (62 mg, 42%) with 94% de; and oxazolidin-2-thiones (*R*,*S*)-*syn*- and (*S*,*S*)-*anti*-**88** (12 mg, 8%) with 92% de.

4.13. Procedure for probing the mutual kinetic resolution of active ester (*rac*)-15 using oxazolidin-2-ones (*rac*)-2 and (*rac*)-89–91

4.13.1. Synthesis of 4-methyl-5-phenyl-3-(2-phenylpropanoyl)oxazolidin-2-one (*rac*)-*anti,syn*-92 and 4-methyl-5-phenyl-3-(2-phenylpropanoyl)oxazolidin-2-one (*rac*)-*syn,syn*-92

In the same way as the oxazolidin-2-one (*rac*)-**4**, *n*-butyl lithium (0.6 mL, 2.5 M in hexane, 1.50 mmol), 4-methyl-5-phenyloxazolidin-2-one (*rac*)-**89** (0.24 g, 1.36 mmol) and pentafluorophenyl 2-phenylpropanoate (*rac*)-**15** (0.47 g, 1.50 mmol), gave the oxazolidin-2-ones *syn,syn*- and *anti,syn*-**92** (ratio 68:32: *syn,syn*-:*anti*,

syn-). The crude residue was purified by flash chromatography on silica gel eluting with light petroleum ether (bp 40–60 °C)/diethyl ether (7:3) to give the oxazolidin-2-one (*rac*)-*anti*,*syn*-**92** (89 mg, 21%) as a colourless oil; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.76; ν_{max} ($CHCl_3$) cm^{-1} 1778 (OC=O) and 1697 (NC=O); δ_H (400 MHz; $CDCl_3$) 7.43–7.38 (3H, m, 3 × CH; Ph), 7.37–7.30 (4H, m, 4 × CH; 2 × Ph), 7.28–7.22 (3H, m, 3 × CH; Ph), 5.49 (1H, d, *J* 7.1, OCHPh), 5.14 (1H, q, *J* 7.1, PhC*H*CH_3), 4.68 (1H, m, CH_3C*H*N), 1.51 (3H, d, *J* 7.1, PhCHC*H*$_3$) and 0.94 (3H, d, *J* 6.6, C*H*$_3$CHN); δ_C (100 MHz; $CDCl_3$) 174.1 (NC=O), 152.4 (OC=O), 140.3 (*i*-C; Ph; $PhCHCH_3$), 133.0 (*i*-C; Ph; PhCHO), 129.4,[5] 127.9,[2] 127.0[1] and 125.4[2] (10 × CH; 2 × Ph), 78.4 (OCHPh), 55.1 (CH_3*C*HN), 43.1 (Ph*C*HCH$_3$), 19.0 (*C*H$_3$CHN) and 14.3 (PhCH*C*H$_3$) (Found MH^+ 310.1430. $C_{19}H_{20}NO_3^+$ requires MH^+, 310.1443); and the oxazolidin-2-one (*rac*)-*syn*,*syn*-**92** (0.18 g, 42%) as white crystalline solid; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.63; mp 92–95 °C; ν_{max} ($CHCl_3$) cm^{-1} 1774 (OC=O) and 1701 (NC=O); δ_H (400 MHz; $CDCl_3$) 7.42–7.37 (2H, m, 2 × CH; Ph), 7.36–7.30 (5H, m, 5 × CH; 2 × Ph), 7.28–7.24 (1H, m, CH; Ph), 7.21–7.16 (2H, m, 2 × CH; Ph), 5.64 (1H, d, *J* 7.2, OCHPh), 5.08 (1H, q, *J* 7.1, PhCHC*H*$_3$), 4.82 (1H, m, C*H*$_3$CHN), 1.51 (3H, d, *J* 7.1, PhCHC*H*$_3$) and 0.74 (3H, d, *J* 6.6, C*H*$_3$CHN); δ_C (100 MHz; $CDCl_3$) 174.0 (NC=O), 152.3 (OC=O), 140.1 (*i*-C; Ph; $PhCHCH_3$), 133.3 (*i*-C; Ph; PhCHO), 128.5,[1] 128.4,[4] 127.9,[2] 126.9[1] and 125.5[2] (10 × CH; 2 × Ph), 78.8 (OCHPh), 54.4 (CH_3CHN), 43.3 (Ph*C*HCH$_3$), 19.3 (*C*H$_3$CHN) and 14.0 (PhCHC*H*$_3$) (Found MH^+ 310.1460. $C_{19}H_{20}NO_3^+$ requires 310.1443).

4.13.2. Synthesis of 4-benzyl-3-(2-phenylpropanoyl)oxazolidine-2-one (*rac*)-*anti*-93 and 4-benzyl-3-(2-phenylpropanoyl)oxazolidine-2-one (*rac*)-*syn*-93

In the same way as the oxazolidin-2-one (*rac*)-**4**, *n*-butyl lithium (0.6 mL, 2.5 M in hexane, 1.50 mmol), 4-benzyl-oxazolidin-2-one (*rac*)-**90** (0.24 g, 1.36 mmol) and pentafluorophenyl 2-phenylpropanoate (*rac*)-**15** (0.47 g, 1.50 mmol), gave the oxazolidin-2-ones *syn*- and *anti*-**27** (ratio 70:30:*syn*-:*anti*-). The crude residue was purified by flash chromatography on silica gel eluting with light petroleum ether (bp 40–60 °C)/diethyl ether (7:3) to give the oxazolidin-2-one (*rac*)-*anti*-**93** (93 mg, 22%) as a white crystalline solid; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.66; mp 64–67 °C; ν_{max} ($CHCl_3$) cm^{-1} 1780 (OC=O) and 1699 (NC=O); δ_H (400 MHz; $CDCl_3$) 7.39–7.21 (10H, m, 10 × CH; 2 × Ph), 5.12 (1H, q, *J* 7.0, PhC*H*CH_3), 4.61–4.55 (1H, m, BnCHN), 4.10 (1H, dd, *J* 9.2 and 2.4, C*H*$_A$H$_B$O), 4.01 (1H, t, *J* 9.2, CH$_A$*H*$_B$O), 3.35 (1H, dd, *J* 13.1 and 3.2, C*H*$_A$H$_B$Ph), 2.80 (1H, dd, *J* 13.1 and 9.8, CH$_A$*H*$_B$Ph) and 1.55 (3H, d, *J* 7.0, PhCHC*H*$_3$); δ_C (100 MHz; $CDCl_3$) 174.5 (NC=O), 152.7 (OC=O), 140.2 (*i*-C; Ph), 135.3 (*i*-C; Ph), 129.3,[2] 128.8,[2] 128.5,[2] 128.0,[2] 127.2[1] and 127.1[1] (10 × CH; 2 × Ph), 65.7 (CH_2O), 55.8 (BnCHN), 42.8 (Ph*C*HCH$_3$), 37.8 (CH_2Ph) and 19.3 (PhCH*C*H$_3$) (Found MH^+ 310.1442. $C_{19}H_{20}NO_3^+$ requires 310.1443); and the oxazolidin-2-one (*rac*)-*syn*-**93** (0.206 g, 49%) as a colourless oil; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.43; ν_{max} ($CHCl_3$) cm^{-1} 1775 (OC=O) and 1700 (NC=O); δ_H (400 MHz; $CDCl_3$) 7.49–7.45 (2H, m, 2 × CH; Ph), 7.40–7.34 (2H, m, 2 × CH; Ph), 7.31–7.28 (1H, m, CH; Ph), 7.23–7.18 (3H, m, 3 × CH; Ph), 6.98–6.94 (2H, m, 2 × CH; Ph), 5.11 (1H, q, *J* 6.9, PhC*H*CH_3), 4.78–4.72 (1H, m, BnCHN), 4.18 (1H, t, *J* 8.5, C*H*$_A$H$_B$O), 4.07 (1H, dd *J* 8.5 and 3.2, CH$_A$*H*$_B$O), 3.08 (1H, dd *J* 13.5 and 3.2, C*H*$_A$H$_B$Ph), 2.58 (1H, dd, *J* 13.5 and 8.8, CH$_A$*H*$_B$Ph) and 1.52 (3H, d, *J* 6.9, PhCHC*H*$_3$); δ_C (100 MHz; $CDCl_3$) 174.1 (NC=O), 152.7 (OC=O), 149.9 (*i*-C; Ph$_A$), 134.7 (*i*-C; Ph$_B$), 129.2,[2] 128.5,[2] 128.4,[2] 128.0,[2] 127.0[1] and 126.9[1] (10 × CH; 2 × Ph), 65.5 (CH_2O), 54.6 (BnCHN), 42.9 (Ph*C*HCH$_3$), 37.0 (CH_2Ph) and 18.9 (PhCH*C*H$_3$) (Found MH^+ 310.1438. $C_{19}H_{20}NO_3^+$ requires 310.1443).

4.13.3. Synthesis of 4-isopropyl-3-(2-phenylpropanoyl)oxazolidin-2-one (*rac*)-*anti*-5 and 4-isopropyl-3-(2-phenylpropanoyl)oxazolidin-2-one (*rac*)-*syn*-5

In the same way as the oxazolidin-2-one (*rac*)-**4**, *n*-butyl lithium (0.6 mL, 2.5 M in hexane, 1.50 mmol), 4-isopropyl-oxazolidin-2-one (*rac*)-**2** (0.17 g, 1.36 mmol) and pentafluorophenyl 2-phenylpropanoate (*rac*)-**15** (0.47 g, 1.50 mmol), gave the oxazolidin-2-ones *syn*- and *anti*-**5** (ratio 95:5:*syn*-:*anti*-). The crude residue was purified by flash chromatography on silica gel eluting with light petroleum ether (bp 40–60 °C)/diethyl ether (7:3) to give the oxazolidin-2-one (*rac*)-*anti*-**5** (10 mg, 3%) as a colourless oil; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.64; ν_{max} (film) cm^{-1} 1774 (OC=O) and 1701 (NC=O); δ_H (400 MHz; $CDCl_3$) 7.38–7.21 (5H, m, 5 × CH; Ph), 5.15 (1H, q, *J* 7.0, PhC*H*CH_3), 4.39–4.33 (1H, dt, *J* 9.1 and 3.2, *i*-PrCHN), 4.10 (1H, dd, *J* 9.1 and 3.2, C*H*$_A$H$_B$O), 4.02 (1H, t, *J* 9.1, CH$_A$*H*$_B$O), 2.46–2.38 (1H, m, C*H*$(CH_3)_2$), 1.51 (3H, d, *J* 7.0, PhCHC*H*$_3$), 0.91 (3H, d, *J* 7.0, C*H*$_3^A$CHC*H*$_3^B$) and 0.90 (3H, d, *J* 6.9, CH$_3^A$CHC*H*$_3^B$); δ_C (100 MHz; $CDCl_3$) 174.3 (NC=O), 153.4 (OC=O), 140.1 (*i*-C; Ph), 128.3,[2] 127.9[2] and 126.9[1] (5 × CH; Ph), 62.8 (CH_2O), 58.7 (*i*-PrCHN), 42.7 (Ph*C*HCH$_3$), 28.3 (*C*H$(CH_3)_2$), 19.5 (*C*H$_3^A$CHCH$_3^B$), 17.7 (CH$_3^A$CHCH$_3^B$) and 14.5 (PhCHCH$_3$) (Found MH^+ 262.1434; $C_{15}H_{20}NO_3^+$ requires 262.1443); the oxazolidin-2-one (*rac*)-*syn*-**5** (0.196 g, 55%) as a white crystalline solid; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.43; mp 44–47 °C; ν_{max} ($CHCl_3$) cm^{-1} 1774 (OC=O) and 1703 (NC=O); δ_H (400 MHz; $CDCl_3$) 7.37–7.32 (3H, m, 4 × CH; Ph), 7.23–7.18 (2H, m, 2 × CH; Ph), 5.13 (1H, q, *J* 6.9, PhC*H*CH_3), 4.47 (1H, dt, *J* 8.9 and 3.5, *i*-PrCHN), 4.22 (1H, t, *J* 8.9, C*H*$_A$H$_B$O), 4.09 (1H, dd, *J* 8.9 and 3.5, CH$_A$*H*$_B$O), 2.21–2.12 (1H, m, C*H*$(CH_3)_2$), 1.46 (3H, d, *J* 6.9, PhCHC*H*$_3$), 0.79 (3H, d, *J* 7.0, C*H*$_3^A$CHCH$_3^B$) and 0.44 (3H, d, *J* 6.9, CH$_3^A$CHC*H*$_3^B$); δ_C (100 MHz; $CDCl_3$) 174.4 (NC=O), 153.4 (OC=O), 140.4 (*i*-C; Ph), 128.4,[2] 127.9[2] and 127.0[1] (5 × CH; Ph), 62.8 (CH_2O), 57.9 (*i*-PrCHN), 43.2 (Ph*C*HCH$_3$), 27.8 (*C*H$(CH_3)_2$), 18.8 (*C*H$_3^A$CHCH$_3^B$), 17.7 (CH$_3^A$C*H*CH$_3^B$) and 13.9 (PhCH*C*H$_3$) (Found MH^+ 262.1432; $C_{15}H_{20}NO_3^+$ requires 262.1443).

4.13.4. Synthesis of ethyl 2-oxa-3-(2-phenylpropanoyl)oxazolidin-4-carboxylate (*rac*)-*anti*-94 and ethyl 2-oxa-3-(2-phenylpropanoyl)oxazolidin-4-carboxylate (*rac*)-*syn*-94

In the same way as the oxazolidin-2-one (*rac*)-**4**, *n*-butyl lithium (0.6 mL, 2.5 M in hexane, 1.50 mmol), ethyl oxazolidin-2-one 4-carboxylate (*rac*)-**91** (0.40 g, 1.36 mmol) and pentafluorophenyl 2-phenylpropanoate (*rac*)-**15** (0.21 g, 1.50 mmol), gave the oxazolidin-2-ones *syn*- and *anti*-**94** (ratio 95:5:*syn*-:*anti*-). The crude residue was purified by flash chromatography on silica gel eluting with light petroleum ether (bp 40–60 °C)/diethyl ether (7:3) to give the oxazolidin-2-one (*rac*)-*anti*-**94** (12 mg, 3%) as a colourless oil; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.42; ν_{max} ($CHCl_3$) cm^{-1} 1794 (OC=O), 1747 (CC=O) and 1705 (NC=O); δ_H (400 MHz; $CDCl_3$) 7.33–7.20 (5H, m, 5 × CH; Ph), 5.10 (1H, q, *J* 7.0, PhC*H*CH_3), 4.77 (1H, dd, *J* 9.2 and 3.5, EtO$_2$CC*H*N), 4.38 (1H, t, *J* 9.2, C*H*$_A$H$_B$O), 4.29 (1H, q, *J* 7.2, C*H*$_3$CH$_A$H$_B$O), 4.28 (1H, q, *J* 7.2, C*H*$_3$CH$_A$*H*$_B$O), 4.26 (1H, dd, *J* 9.2 and 3.5, CH$_A$*H*$_B$O), 1.50 (3H, d, *J* 7.0, PhCHC*H*$_3$) and 1.30 (3H, t, *J* 7.2, C*H*$_3$CH$_2$O); δ_C (100 MHz; $CDCl_3$) 174.5 (NC=O), 168.7 (CC=O), 152.1 (OC=O), 140.0 (*i*-C; Ph), 128.7,[2] 128.3[2] and 127.4[1] (5 × CH; Ph), 64.3 (CH_2O), 62.6 (CH_2O), 55.9 (EtO$_2$CCHN), 43.0 (Ph*C*HCH$_3$), 19.3 (PhCH*C*H$_3$) and 14.1 (*C*H$_3$CH$_2$O) (Found MH^+, 292.1195; $C_{15}H_{18}NO_5^+$ requires 292.1185); and the oxazolidin-2-one (*rac*)-*syn*-**94** (0.236 g, 60%) as a colourless oil; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.30; ν_{max} ($CHCl_3$) cm^{-1} 1793 (OC=O), 1747 (CC=O) and 1705 (NC=O); δ_H (400 MHz; $CDCl_3$) 7.40–7.20 (5H, m, 5 × CH; Ph), 5.03 (1H, q, *J* 7.0, PhC*H*CH_3), 4.94 (1H, dd, *J* 9.3 and 4.9, EtO$_2$CCHN), 4.52 (1H, t, *J* 9.3, C*H*$_A$H$_B$O), 4.23 (1H, dd, *J* 9.3 and 4.9, CH$_A$*H*$_B$O), 4.11 (2H, q, *J* 7.2, CH$_3$C*H*$_2$O), 1.48 (3H, d, *J* 7.0,

PhCHCH_3) and 1.11 (3H, t, J 7.2, CH_3CH$_2$O); δ_C (100 MHz; $CDCl_3$) 174.1 (NC=O), 167.9 (CC=O), 151.8 (OC=O), 139.6 (*i*-C; Ph), 128.4,[2] 128.1[2] and 127.1[1] (5 × CH; Ph), 64.1 (CH_2O), 62.3 (CH_2O), 55.6 (EtO_2CCHN), 43.0 (PhCHCH$_3$), 19.2 (PhCHCH_3) and 13.7 (CH_3CH$_2$O) (Found MH^+, 292.1195; $C_{15}H_{18}NO_5^+$ requires 292.1185).

4.14. Parallel kinetic resolutions of active ester (*rac*)-15 using a *quasi*-enantiomeric combination of oxazolidin-2-ones (*S*)-2, (*R*)-1, (4*R*,5*S*)-89, (*S*)-90 and (*S*)-8[18]

4.14.1. Parallel kinetic resolution of pentafluorophenyl 2-phenylpropanoate (*rac*)-15 with 4-methyl-5-phenyloxazolidin-2-one (4*R*,5*S*)-89 and 4-benzyl oxazolidin-2-one (*S*)-90

In the same way as the oxazolidin-2-one (*rac*)-**4**, *n*-butyl lithium (0.58 mL, 2.5 M in hexane, 1.45 mmol), 4-methyl-5-phenyloxazolidin-2-one (4*R*,5*S*)-**89** (0.115 g, 0.65 mmol), 4-benzyl oxazolidin-2-one (*S*)-**90** (0.115 g, 0.65 mmol) and pentafluorophenyl 2-phenylpropanoate (*rac*)-**15** (0.458 g, 1.45 mmol), gave a mixture of two diastereoisomeric oxazolidin-2-ones (*S*,*R*,*S*)-*syn*,*syn*- and (*R*,*R*,*S*)-*anti*,*syn*-**92** (ratio 64:36:*syn*,*syn*-:*anti*,*syn*-) and oxazolidin-2-ones (*R*,*S*)-*syn*- and (*S*,*S*)-*anti*-**93** (ratio 71:29:*syn*-:*anti*-). The crude residue was purified by flash chromatography on silica gel eluting with light petroleum ether (bp 40–60 °C)/diethyl ether (7:3) to give the oxazolidin-2-one (2*R*,4*R*,5*S*)-*anti*,*syn*-**92** (36 mg, 18%) as a white crystalline solid; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.76; mp 89–92 °C; ν_{max} ($CHCl_3$) cm^{-1} 1779 (OC=O) and 1700 (NC=O); $[\alpha]_D^{25} = -42.7$ (*c* 3.0, $CHCl_3$) (Found MH^+ 310.1430. $C_{19}H_{20}NO_3^+$ requires MH^+, 310.1443); the oxazolidin-2-one (2*S*,4*R*,5*S*)-*syn*,*syn*-**92** (66 mg, 33%) as a white crystalline solid; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.63; mp 121–123 °C; ν_{max} ($CHCl_3$) cm^{-1} 1780 (OC=O) and 1701 (NC=O); $[\alpha]_D^{25} = +105.9$ (*c* 2.6, $CHCl_3$) (Found MH^+ 310.1460. $C_{19}H_{20}NO_3^+$ requires 310.1443); the oxazolidin-2-one (*S*,*S*)-*anti*-**93** (28 mg, 14%) as a colourless oil; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.66; ν_{max} ($CHCl_3$) cm^{-1} 1780 (OC=O) and 1700 (NC=O); $[\alpha]_D^{25} = +130.4$ (*c* 1.8, $CHCl_3$) (Found MH^+ 310.1438. $C_{19}H_{20}NO_3^+$ requires 310.1443); and the oxazolidin-2-one (*R*,*S*)-*syn*-**93** (6 mg, 34%) as a colourless oil; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.43; ν_{max} ($CHCl_3$) cm^{-1} 1775 (OC=O) and 1700 (NC=O); $[\alpha]_D^{25} = +2.8$ (*c* 5.5, $CHCl_3$) (Found MH^+ 310.1438. $C_{19}H_{20}NO_3^+$ requires 310.1443).

R_F differences [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)]—(*R*,*R*,*S*)-*anti*-**92** (R_F 0.76); (*S*,*R*,*S*)-*syn*-**92** (R_F 0.63); (*R*,*S*)-*anti*-**93** (R_F 0.66); and (*S*,*S*)-*syn*-**93** (R_F 0.43).

4.14.2. Parallel kinetic resolution of pentafluorophenyl 2-phenylpropanoate (*rac*)-15 with 4-methyl-5-phenyloxazolidin-2-one (4*R*,5*S*)-89 and 4-isopropyl oxazolidin-2-one (*S*)-2

In the same way as the oxazolidin-2-one (*rac*)-**4**, *n*-butyl lithium (0.58 mL, 2.5 M in hexane, 1.45 mmol), 4-methyl-5-phenyloxazolidin-2-one (4*R*,5*S*)-**89** (0.115 g, 0.65 mmol), 4-isopropyl oxazolidin-2-one (*S*)-**2** (83 mg, 0.65 mmol) and pentafluorophenyl 2-phenylpropanoate (*rac*)-**15** (0.458 g, 1.45 mmol), gave a mixture of two diastereoisomeric oxazolidin-2-ones (*S*,*R*,*S*)-*syn*,*syn*- and (*R*,*R*,*S*)-*anti*,*syn*-**92** (ratio 83:17:*syn*,*syn*-:*anti*,*syn*-) and oxazolidin-2-ones (*R*,*S*)-*syn*- and (*S*,*S*)-*anti*-**5** (ratio 85:15:*syn*-:*anti*-). The crude residue was purified by flash chromatography on silica gel eluting with light petroleum ether (bp 40–60 °C)/diethyl ether (7:3) to give the oxazolidin-2-one (2*R*,4*R*,5*S*)-*syn*,*anti*-**92** (26 mg, 13%) as a white crystalline solid; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.76; mp 89–92 °C; ν_{max} ($CHCl_3$) cm^{-1} 1779 (OC=O) and 1700 (NC=O); $[\alpha]_D^{25} = -42.7$ (*c* 3.0, $CHCl_3$) (Found MH^+ 310.1430. $C_{19}H_{20}NO_3^+$ requires MH^+, 310.1443); oxazolidin-2-one (2*S*,4*R*5*S*)-*syn*,*syn*-**92** (0.121 g, 59%) as a white crystalline solid; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.63; mp 121–12 °C; ν_{max} ($CHCl_3$) cm^{-1} 1780 (OC=O) and 1701 (NC=O); $[\alpha]_D^{25} = +105.9$ (*c* 2.6, $CHCl_3$) (Found MH^+ 310.1460. $C_{19}H_{20}NO_3^+$ requires 310.1443); the oxazolidin-2-one (*S*,*S*)-*anti*-**5** (19 mg, 11%) as a white crystalline solid; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.58; mp 158–160 °C; ν_{max} ($CHCl_3$) cm^{-1} 1780 (OC=O) and 1700 (NC=O); $[\alpha]_D^{25} = -165.2$ (*c* 2.0, $CHCl_3$) (Found MH^+, 296.1282; $C_{18}H_{18}NO_3^+$ requires 296.1287); and the oxazolidin-2-one (*R*,*S*)-*syn*-**5** (0.106 g, 63%) as a white solid; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.42; mp 140–142 °C; ν_{max} ($CHCl_3$) cm^{-1} 1778 (OC=O) and 1701 (NC=O); $[\alpha]_D^{25} = +88.5$ (*c* 4.0, $CHCl_3$) (Found MH^+, 296.1286; $C_{15}H_{18}NO_3^+$ requires 296.1287). R_F differences [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)]—(*R*,*R*,*S*)-*anti*-**92** (R_F 0.76); (*S*,*R*,*S*)-*syn*-**92** (R_F 0.63); (*R*,*S*)-*anti*-**5** (R_F 0.58); and (*S*,*S*)-*syn*-**5** (R_F 0.42).

4.14.3. Parallel kinetic resolution of pentafluorophenyl 2-phenylpropanoate (*rac*)-15 with ethyl oxazolidin-2-one 4-carboxylate (*S*)-91 and 4-benzyl oxazolidin-2-one (*S*)-90

In the same way as the oxazolidin-2-one (*rac*)-**4**, *n*-butyl lithium (0.58 mL, 2.5 M in hexane, 1.45 mmol), ethyl oxazolidin-2-one 4-carboxylate (*S*)-**91** (0.103 g, 0.65 mmol), 4-benzyl-oxazolidin-2-one (*S*)-**90** (0.115 g, 0.65 mmol) and pentafluorophenyl 2-phenylpropanoate (*rac*)-**15** (0.458 g, 1.45 mmol), gave a mixture of two diastereoisomeric oxazolidin-2-ones (*S*,*S*)-*syn*- and (*R*,*S*)-*anti*-**93** (ratio 93:7:*syn*-:*anti*-) and oxazolidin-2-ones (*R*,*S*)-*syn*- and (*S*,*S*)-*anti*-**93** (ratio 80:20:*syn*-:*anti*-). The crude residue was purified by flash chromatography on silica gel eluting with light petroleum ether (bp 40–60 °C)/diethyl ether (7:3) to give the oxazolidin-2-one (*R*,*S*)-*anti*-**94** (6 mg, 3%) as a colourless oil; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.42; ν_{max} ($CHCl_3$) cm^{-1} 1794 (OC=O), 1747 (CC=O) and 1705 (NC=O); $[\alpha]_D^{25} = -130.5$ (*c* 2.1, $CHCl_3$); and the oxazolidin-2-one (*S*,*S*)-*syn*-**94** (76 mg, 40%) as a white powder; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.30; mp 97–99 °C; $[\alpha]_D^{25} = +24.8$ (*c* 5.3, $CHCl_3$); ν_{max} ($CHCl_3$) cm^{-1} 1793 (OC=O), 1747 (CC=O) and 1705 (NC=O); (Found MH^+, 292.1195; $C_{15}H_{18}NO_5^+$ requires 292.1185); the oxazolidin-2-one (*S*,*S*)-*anti*-**93** (26 mg, 13%) as a colourless oil; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.66; ν_{max} ($CHCl_3$) cm^{-1} 1780 (OC=O) and 1700 (NC=O); $[\alpha]_D^{25} = +130.4$ (*c* 1.8, $CHCl_3$) (Found MH^+ 310.1438. $C_{19}H_{20}NO_3^+$ requires 310.1443); and the oxazolidin-2-one (*R*,*S*)-*syn*-**93** (0.108 g, 54%) as a colourless oil; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.43; ν_{max} ($CHCl_3$) cm^{-1} 1775 (OC=O) and 1700 (NC=O); $[\alpha]_D^{25} = +2.8$ (*c* 5.5, $CHCl_3$) (Found MH^+ 310.1438. $C_{19}H_{20}NO_3^+$ requires 310.1443). R_F differences [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)]—(*R*,*S*)-*anti*-**94** (R_F 0.42); (*S*,*S*)-*syn*-**94** (R_F 0.30); (*S*,*S*)-*anti*-**93** (R_F 0.66); and (*R*,*S*)-*syn*-**93** (R_F 0.43).

4.14.4. Parallel kinetic resolution of pentafluorophenyl 2-phenylpropanoate (*rac*)-15 with 4-phenyloxazolidin-2-one (*R*)-1 and 4-benzyl oxazolidin-2-one (*S*)-90

In the same way as the oxazolidin-2-one (*rac*)-**4**, *n*-butyl lithium (0.58 mL, 2.5 M in hexane, 1.45 mmol), 4-phenyloxazolidin-2-one (*R*)-**1** (0.106 g, 0.65 mmol), 4-benzyl-oxazolidin-2-one (*S*)-**90** (0.115 g, 0.65 mmol) and pentafluorophenyl 2-phenylpropanoate (*rac*)-**15** (0.458 g, 1.45 mmol), gave a mixture of two diastereoisomeric oxazolidin-2-ones (*S*,*R*)-*syn*- and (*R*,*R*)-*anti*-**4** (ratio 91:9:*syn*-:*anti*-) and oxazolidin-2-ones (*R*,*S*)-*syn*- and (*S*,*S*)-*anti*-**93** (ratio 83:17:*syn*-:*anti*-). The crude residue was purified by flash chromatography on silica gel eluting with light petroleum ether (bp 40–60 °C)/diethyl ether (7:3) to give oxazolidin-2-one (*R*,*R*)-*anti*-**4** (11 mg, 6%) as a colourless oil; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.64; ν_{max} (film) cm^{-1} 1774 (OC=O) and 1701 (NC=O); $[\alpha]_D^{25} = +128.9$ (*c* 3.5, $CHCl_3$) (Found MH^+

262.1434; $C_{15}H_{20}NO_3^+$ requires 262.1443); the oxazolidin-2-one (*S*,*R*)-*syn*-**4** (0.111 g, 58%) as a colourless oil; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.43; ν_{max} ($CHCl_3$) cm^{-1} 1774 (OC=O) and 1703 (NC=O); $[\alpha]_D^{25} = -19.8$ (*c* 3.3, $CHCl_3$) (Found MH^+ 262.1432; $C_{15}H_{20}NO_3^+$ requires 262.1443); the oxazolidin-2-one (*S*,*S*)-*anti*-**93** (16 mg, 8%) as a colourless oil; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.66; ν_{max} ($CHCl_3$) cm^{-1} 1780 (OC=O) and 1700 (NC=O); $[\alpha]_D^{25} = +130.4$ (*c* 1.8, $CHCl_3$) (Found MH^+ 310.1438. $C_{19}H_{20}NO_3^+$ requires 310.1443); and the oxazolidin-2-one (*R*,*S*)-*syn*-**93** (80 mg, 40%) as a colourless oil; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.43; ν_{max} ($CHCl_3$) cm^{-1} 1775 (OC=O) and 1700 (NC=O); $[\alpha]_D^{25} = +2.8$ (*c* 5.5, $CHCl_3$) (Found MH^+ 310.1438. $C_{19}H_{20}NO_3^+$ requires 310.1443). R_F differences [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)]—(*R*,*R*)-*anti*-**4** (R_F 0.64); (*S*,*R*)-*syn*-**4** (R_F 0.43); (*S*,*S*)-*anti*-**93** (R_F 0.66); and (*R*,*S*)-*syn*-**93** (R_F 0.43).

4.14.5. Parallel kinetic resolution of pentafluorophenyl 2-phenylpropanoate (*rac*)-15 with 4-isopropyl-oxazolidin-2-one (*S*)-2 and ethyl oxazolidin-2-one 4-carboxylate (*S*)-91

In the same way as the oxazolidin-2-one (*rac*)-**4**, *n*-butyl lithium (0.58 mL, 2.5 M in hexane, 1.45 mmol), 4-isopropyl-oxazolidin-2-one (*S*)-**2** (84 mg, 0.65 mmol), ethyl oxazolidin-2-one 4-carboxylate (*S*)-**91** (0.103 g, 0.65 mmol) and pentafluorophenyl 2-phenylpropanoate (*rac*)-**15** (0.458 g, 1.45 mmol), gave a mixture of two diastereoisomeric oxazolidin-2-ones (*R*,*S*)-*syn*- and (*S*,*S*)-*anti*-**5** (ratio 95:5:*syn*-:*anti*-) and oxazolidin-2-ones (*S*,*S*)-*syn*- and (*R*,*S*)-*anti*-**94** (ratio 95:5:*syn*-:*anti*-). The crude residue was purified by flash chromatography on silica gel eluting with light petroleum ether (bp 40–60 °C)/diethyl ether (7:3) to give oxazolidin-2-one (*R*,*S*)-*anti*-**94** (4 mg, 2%) as a colourless oil; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.42; ν_{max} ($CHCl_3$) cm^{-1} 1794 (OC=O), 1747 (CC=O) and 1705 (NC=O); $[\alpha]_D^{25} = -130.5$ (*c* 2.1, $CHCl_3$); the oxazolidin-2-one (*S*,*S*)-*syn*-**94** (90 mg, 47%) as a white powder; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.30; mp 97–99 °C; $[\alpha]_D^{25} = +24.8$ (*c* 5.3, $CHCl_3$); ν_{max} ($CHCl_3$) cm^{-1} 1793 (OC=O), 1747 (CC=O) and 1705 (NC=O); (Found MH^+, 292.1195; $C_{15}H_{18}NO_5^+$ requires 292.1185); oxazolidin-2-one (*S*,*S*)-*anti*-**5** (5 mg, 3%) as a colourless oil; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.64; ν_{max} (film) cm^{-1} 1774 (OC=O) and 1701 (NC=O); $[\alpha]_D^{25} = +128.9$ (*c* 3.5, $CHCl_3$) (Found MH^+ 262.1434; $C_{15}H_{20}NO_3^+$ requires 262.1443); and the oxazolidin-2-one (*R*,*S*)-*syn*-**5** (96 mg, 57%) as a colourless oil; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.43; ν_{max} ($CHCl_3$) cm^{-1} 1774 (OC=O) and 1703 (NC=O); $[\alpha]_D^{25} = -19.8$ (*c* 3.3, $CHCl_3$) (Found MH^+ 262.1432; $C_{15}H_{20}NO_3^+$ requires 262.1443). R_F differences [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)]—(*S*,*S*)-*anti*-**5** (R_F 0.64); (*R*,*S*)-*syn*-**5** (R_F 0.43); (*R*,*S*)-*anti*-**94** (R_F 0.42) and (*S*,*S*)-*syn*-**94** (R_F 0.30).

4.14.6. Parallel kinetic resolution of pentafluorophenyl 2-phenylpropanoate (*rac*)-15 with 4-phenyl oxazolidin-2-one (*R*)-1 and 4-isopropyl-oxazolidin-2-one (*S*)-2

In the same way as the oxazolidin-2-one (*rac*)-**4**, *n*-butyl lithium (0.58 mL, 2.5 M in hexane, 1.45 mmol), 4-isopropyl-oxazolidin-2-one (*S*)-**2** (84 mg, 0.65 mmol), 4-phenyloxazolidin-2-one (*R*)-**1** (0.106 g, 0.65 mmol) and pentafluorophenyl 2-phenylpropanoate (*rac*)-**15** (0.458 g, 1.45 mmol), gave a mixture of two diastereoisomeric oxazolidin-2-ones (*S*,*R*)-*syn*- and (*R*,*R*)-*anti*-**4** (ratio 95:8:*syn*-:*anti*-) and oxazolidin-2-ones (*R*,*S*)-*syn*- and (*S*,*S*)-*anti*-**5** (ratio 95:5:*syn*-:*anti*-). The crude residue was purified by flash chromatography on silica gel eluting with light petroleum ether (bp 40–60 °C)/diethyl ether (7:3) to give oxazolidin-2-one (*R*,*R*)-*anti*-**4** (6 mg, 3%) as a colourless oil; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.64; ν_{max} (film) cm^{-1} 1774 (OC=O) and 1701 (NC=O); $[\alpha]_D^{25} = +128.9$ (*c* 3.5, $CHCl_3$) (Found MH^+ 262.1434; $C_{15}H_{20}NO_3^+$ requires 262.1443); the oxazolidin-2-one (*S*,*R*)-*syn*-**4** (0.108 g, 57%) as a colourless oil; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.43; ν_{max} ($CHCl_3$) cm^{-1} 1774 (OC=O) and 1703 (NC=O); $[\alpha]_D^{25} = -19.8$ (*c* 3.3, $CHCl_3$) (Found MH^+ 262.1432; $C_{15}H_{20}NO_3^+$ requires 262.1443); the oxazolidin-2-one (*S*,*S*)-*anti*-**5** (5 mg, 3%) as a white crystalline solid; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.58; mp 158–160 °C; ν_{max} ($CHCl_3$) cm^{-1} 1780 (OC=O) and 1700 (NC=O); $[\alpha]_D^{25} = -165.2$ (*c* 2.0, $CHCl_3$) (Found MH^+, 296.1282; $C_{18}H_{18}NO_3^+$ requires 296.1287); the oxazolidin-2-one (*R*,*S*)-*syn*-**5** (0.11 g, 57%) as a white solid; R_F [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)] 0.42; mp 140–142 °C; ν_{max} ($CHCl_3$) cm^{-1} 1778 (OC=O) and 1701 (NC=O); $[\alpha]_D^{25} = +88.5$ (*c* 4.0, $CHCl_3$) (Found MH^+, 296.1286; $C_{15}H_{18}NO_3^+$ requires 296.1287). R_F differences [light petroleum ether (bp 40–60 °C)/diethyl ether (1:1)]—(*R*,*R*)-*anti*-**4** (R_F 0.64); (*S*,*R*)-*syn*-**4** (R_F 0.43); (*R*,*S*)-*anti*-**5** (R_F 0.58) and (*S*,*S*)-*syn*-**5** (R_F 0.42).

4.15. Hydrolysis of oxazolidin-2-ones (*S*,*R*)-4 and (*R*,*S*)-5

4.15.1. 2-Phenyl-propanoic acid (+)-(*S*)-6

Lithium hydroxide monohydrate (71 mg, 1.69 mmol) was slowly added to a stirred solution of oxazolidin-2-one (*S*,*R*)-*syn*-**4** (0.25 g, 0.84 mmol) and hydrogen peroxide (0.47 mL, 3.53 M in H_2O, 1.69 mmol) in THF/water (1:1; 5 mL). The reaction mixture was stirred at room temperature for 12 h. The reaction was quenched with water (10 mL) and extracted with dichloromethane (3 × 10 mL). The combined organic layers were dried (over $MgSO_4$) and evaporated under reduced pressure to give the recovered 4-phenyl oxazolidin-2-one (*R*)-**1** (127 mg, 93%) as a white solid; R_F [ethyl acetate/ethanol (9:1)] 0.71; mp 130–133 °C; $[\alpha]_D^{25} = -54.0$ (*c* 1.0, $CHCl_3$); ν_{max} ($CHCl_3$) cm^{-1} 3262 (NH) and 1736 (C=O); δ_H (400 MHz; $CDCl_3$) 7.41–7.31 (5H, m, 5 × CH; Ph), 5.69 (1H, s, NH), 4.93 (1H, dd, *J* 8.6 and 6.9, PhCHN), 4.72 (1H, t, *J* 8.6, CH_AH_BO) and 4.17 (1H, dd, *J* 8.6 and 6.9, CH_AH_BO); δ_C (100 MHz; $CDCl_3$) 159.4 (C=O), 139.3 (*i*-C; Ph), 129.2,[2] 128.9[1] and 126.0[2] (5 × CH; Ph), 72.5 (CH_2O) and 56.3 (PhCHN) (Found MNH_4^+, 181.0970; $C_9H_{13}N_2O_2$ requires 181.0972). The aqueous phase was acidified using HCl (3 M HCl) until the pH 3, and extracted with diethyl ether (3 × 10 mL). The combined organic phases were dried (over $MgSO_4$) and evaporated under reduced pressure to give 2-phenylpropanoic acid (*S*)-**6** (113 mg, 90%) as a colourless oil; R_F [light petroleum spirit (bp 40–60 °C)/diethyl ether (1:9)] 0.5; $[\alpha]_D^{25} = +69.5$ (*c* 8.2, $CHCl_3$); ν_{max} ($CHCl_3$) cm^{-1} 1706 (C=O); δ_H (400 MHz; $CDCl_3$) 7.26–7.10 (5H, m, 5 × CH; Ph), 3.75 (1H, q, *J* 7.2, PhC*H*CH_3) and 1.50 (3H, d, *J* 7.2, PhCHCH_3); δ_C (100 MHz; $CDCl_3$) 180.4 (C=O), 139.7 (*i*-C; Ph), 128.7,[2] 127.6[2] and 127.4[1] (5 × CH; Ph), 45.3 (PhCHCH$_3$) and 18.1 (PhCHCH_3) (Found MNH_4^+, 151.0753; $C_9H_{11}NO_2$ requires 151.0759).

4.15.2. 2-Phenylpropanoic acid (−)-(*R*)-6

In the same way as the 2-phenylpropanoic acid (*S*)-6, oxazolidin-2-one (*R*,*S*)-*syn*-**5** (0.2 g, 0.76 mmol), lithium hydroxide monohydrate (64 mg, 1.53 mmol) and hydrogen peroxide (0.43 mL, 3.53 M in H_2O, 1.53 mmol) in THF/water (1:1; 3 mL) gave, the recovered 4-isopropyl-oxazolidin-2-one (*S*)-**2** (76 mg, 78%) as a white solid; R_F [ethyl acetate/ethanol (9:1)] 0.82; mp 71–73 °C; $[\alpha]_D^{25} = +13.0$ (*c* 2.6, $CHCl_3$); ν_{max} ($CHCl_3$) cm^{-1} 3455 (NH) and 1750 (C=O); δ_H (400 MHz; $CDCl_3$) 7.26 (1H, broad s, NH), 4.34 (1H, t, *J* 8.7, CH_AH_BO), 4.00 (1H, dd, *J* 8.7 and 6.4, CH_AH_BO) and 3.53 (1H, tdd, *J* 8.7, 6.7 and 6.4, CHN); 1.67–1.57 (1H, br octet, *J* ~6.7, C*H*$(CH_3)_2$, 0.86 (3H, d, *J* 6.7, $CH_3^ACHCH_3^B$) and 0.80 (3H, d, *J* 6.7, $CH_3^ACHCH_3^B$); δ_C (100 MHz, $CDCl_3$) 160.6 (C=O), 68.4 (CH_2O), 58.2 (CHN), 32.6 ($CH(CH_3)_2$), 17.7 ($CH_3^ACHCH_3^B$) and 17.4 ($CH_3^ACHCH_3^B$) (Found MNH_4^+, 147.1129; $C_9H_{15}N_2O_2$ requires

MNH_4^+, 147.1128); and 2-phenylpropanoic acid (*R*)-**6** (97 mg, 85%) as a colourless oil; R_F [light petroleum spirit (bp 40–60 °C)/diethyl ether (1:9)] 0.5; $[\alpha]_D^{25} = -68.5$ (*c* 2.4, $CHCl_3$); ν_{max} ($CHCl_3$) cm^{-1} 1710 (C=O) (Found MNH_4^+, 151.0755; $C_9H_{11}NO_2$ requires 151.0759).

Butyl 2-phenylpropanoate can form by the addition of *n*-BuLi to the active ester. Characterisation data for butyl 2-phenylpropanoate (*rac*)-; R_F [light petroleum (40–60 °C)/diethyl ether (1:1)] 0.85; ν_{max} (film) cm^{-1} 1674 (C=O); δ_H (400 MHz; $CDCl_3$) 7.28–7.15 (5H, m, 5 × CH; Ph), 3.99 (2H, td, *J* 6.8 and 1.5, OCH_2), 3.63 (1H, q, *J* 7.2, PhC*H*CH_3), 1.52–1.43 (2H, m, CH_2), 1.42 (3H, d, *J* 7.2, PhCHC*H*$_3$), 1.28–1.18 (2H, m, CH_2) and 0.79 (3H, t, *J* 7.5, CH_3CH_2); δ_C (100 MHz; $CDCl_3$) 174 (C=O), 140.6 (*i*-C; Ph), 128.4,[2] 127.4[2] and 126.9[1] (5 × CH; Ph), 64.5 (OCH_2), 45.5 (PhCHCH$_3$), 30.4 and 18.9 (2 × CH_2), 18.4 (PhCH*C*H$_3$) and 13.6 (*C*H$_3$CH$_2$) (Found MNH_4^+, 224.1545. $C_{13}H_{22}NO_2$ requires MNH_4^+, 224.1645).

4.16. Computational details

The conformational space of each structure was first explored using the UFF molecular-mechanics force field[19] combined with a Monte Carlo search over 5000 independent conformers using the openbabel package [[openbabel.org]]. The structures were then re-optimised using dispersion-corrected density functional theory (DFT) at the RI-PBE-D/6-311++G(d,p) level of theory using the ORCA ab initio package.[20] The usage of dispersion-corrected DFT[21] is crucial in this case due to the presence of significant π–π interactions. In order to obtain reliable total energies, we re-optimise the RI-PBE-D structures at the RI-TPSS-D/def2-TZVP level of theory. The TPSS functional[22] has been shown to provide a reliable description of energetics and reaction barriers for a number of test sets.[23]

Acknowledgements

We are grateful to the EPSRC (to E.C. and Y.Y), and Queen Mary, University of London, Onyx Scientific Limited (to M.D.) and Syngenta (to S.C.) for studentships, The Royal Society, The University of London Central Research Fund and The University of Hull for their financial support (to E.C. and J.E.), and the EPSRC National Mass Spectrometry Service (Swansea) for accurate mass determinations. We are indebted to the Deutsche Forschungsgemeinschaft for generous support (SFB569-TPN1 to D.M.B.) and we gratefully acknowledge the bwGRiD project for computational resources (www.bw-grid.de).

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