# Lithiated 4-Isopropyl-3-(methylthiomethyl)-5,5-diphenyloxazolidin-2-one: A Chiral Formyl Anion Equivalent for Enantioselective Preparations of 1,2-Diols, 2-Amino Alcohols, 2-Hydroxy Esters, and 4-Hydroxy-2-alkenoates

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The heterocyclic compound specified in the title (and readily prepared from commercial precursors) has a sterically protected C=O group, so that direct lithiation by BuLi at the exocyclic $CH_2$ group is possible (**3** → Li-**3**). The lithiated *N*,*S*-acetal derivative (Li-**3**) adds diastereoselectively to aldehydes (Table 2), unsymmetrical ketones (Table 3), chalcone (1,4-addition, Scheme 2), and *N*-phosphinoyl- and *N*-sulfonylimines (Table 4). Protection of the newly formed OH groups (Scheme 3) and/or MeS/OH displacement by $Hg(O_2CCF_3)_2$ in aqueous THF/acetonitrile converts the *N*,*S*-acetals into hemiaminals (→ **20**) which, in turn, are readily cleaved to aldehydes, with recovery of the chiral auxiliary (**1**, Scheme 4). The aldehydes (especially those lacking α-carbonyl hydrogens) may be isolated, or they are trapped in situ by reduction to (selectively protected) diols or amino alcohols, by addition of Grignard or Li reagents, which provides diols with two stereogenic centers, by oxidation to give 2-hydroxy esters, or by olefination to provide 4-hydroxy-2-alkenoates (Scheme 5). The scope and limitations of the new, overall enantioselective transformation are determined, and the readily recovered chiral auxiliary used is compared with oxazolidinones of other substitution patterns (Scheme 7). The configuration of a number of products has been assigned by single-crystal X-ray diffraction (cf. Figure 5). These structures and similarities of NMR data led to configurational assignment of the other products (see formulas in the schemes and tables) by analogy. A simple mechanistic model for the stereochemical course of the addition of Li-**3** to aldehydes and ketones is presented (Figure 6).

## Introduction

C,C-Bond-forming reactions leading to 1,2-difunctionalized products, such as 1,2-diols, 2-amino alcohols, 2-hydroxy or 2-amino aldehydes, and esters (**A**−**C** in Figure 1) require reagents with reactivity umpolung.[3] The most common enantioselective version of this transformation is the addition to a $R^1R^2C{=}X$ trigonal center of a reagent that is synthetically equivalent to a chiral formyl anion (see retrosynthetic formalism[4] in Figure 1). The aldehydes thus accessible can be reduced to alcohols (**A** → **B**) or oxidized to carboxylic acid derivatives (**A** → **C**).

In some of the more practical realizations of the desired transformation the reagents presented in Figure 2 have been used.[5−10] As can be seen, four of the Li compounds shown are actually acetal derivatives of formyllithium, in one approach an aza-enamine is employed and in another one a Br/Li carbenoid.

The *N*-Boc-protected lithiated oxazolidine and thiazolidine are formed by what is sometimes referred to as heteroatom-directed metalation.[11] This methodology has its origin in the early observations by Durst,[12] Fraser,[13]

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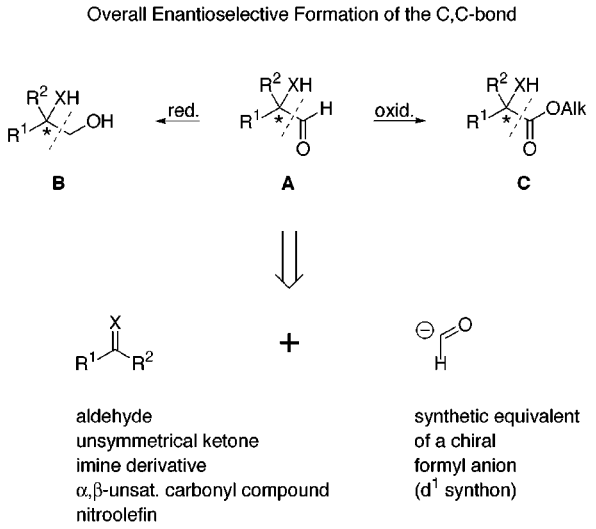


**Figure 1.** Retrosynthetic scheme for the enantioselective preparation of 1,2-difunctionalized compounds with C,C-bond formation.

Beak,[14] Seebach,[15] and their respective co-workers, who found that carboxylic acid derivatives of appropriate substitution pattern can be deprotonated "on the wrong side", i.e., next to the heteroatom rather than in the α-carbonyl position; see selected examples and references in Figure 3.[15−24]

At the time, this metalation was used to provide an umpolung of alcohol, amine, or imine reactivity[25,26] that has also been realized through lithiated nitrosamines.[25,27] One systematic way of generating such amido-alkyllithium reagents was to use carboxylic or carbonic acid derivatives with *sterically protected* C═O groups; see Figure 3, top.

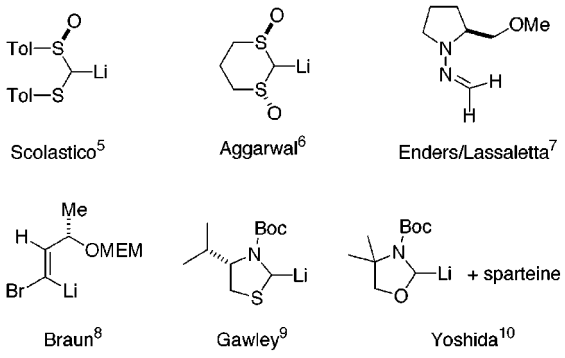


**Figure 2.** Some reagents that are synthetically equivalent to a chiral formyl anion.

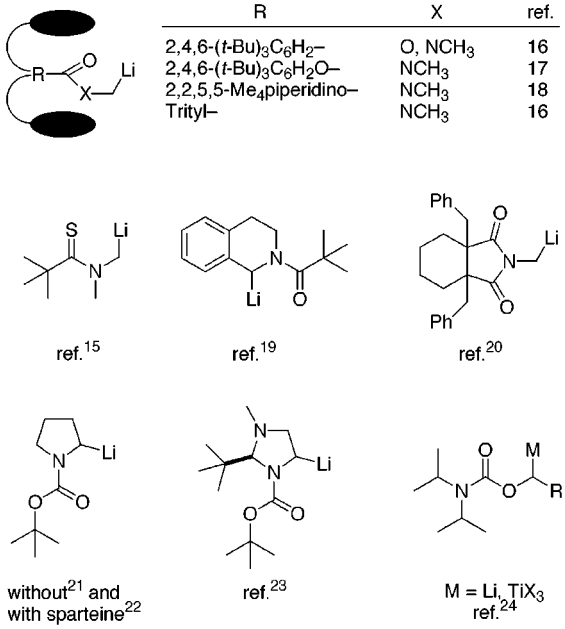


**Figure 3.** Lithiated esters, amides, carbamates, ureas and an imide for nucleophilic hydroxy- and amino alkylations or as reagents that are synthetically equivalent to so-called homoenolates ($d^3$ synthons[18,24]).

Considering the broad scope and applicability of amino acid-derived chiral oxazolidinone auxiliaries (Evans auxiliaries[28]), it was highly desirable to also apply them to the synthetic transformation discussed here. A directed metalation on an exocyclic N-substituent of such an oxazolidinone did not appear promising until recently: the C═O group of these oxazolidinones is too reactive toward strong nucleophiles/bases, such as BuLi. This is why the Sn/Li exchange has been used (see **D** in Figure 4) for the generation of *N*-lithioalkyl oxazolidinones;[29−31] a directed lithiation has only been reported for the

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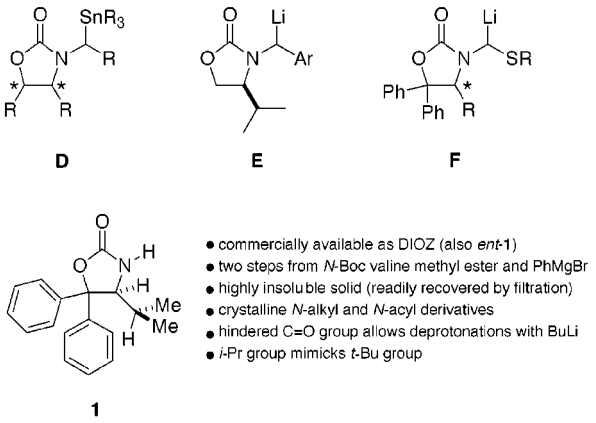



**Figure 4.** Chiral oxazolidinones metalated in the 1-position and the modified Evans auxiliary **1** with superior properties.

oxazolidinone **E** with benzylic acidification of the $NCH_2$ group.[32] On the other hand, we have recently observed that the 5,5-diphenyloxazolidinone **1** has a highly hindered C=O group (no functional group selectivity problem in N-acylated derivatives) and gives well-crystallizing derivatives; see refs 33−38 and comments in Figure 4. Thus, we have been able to lithiate *N*,*S*-acetals derived from oxazolidinone **1** (**F** in Figure 4) and use them as chiral nucleophilic formylation reagents. The results are described in the present full paper.[39]

## Results and Discussion

**Preparation of Chiral *N*-(Methoxymethyl)-, *N*-(Methylthiomethyl)-, *N*-(Phenylthiomethyl)-, and *N*-(*tert*-Butylthiomethyl)oxazolidinones.** *N*,*O*-Acetal **2** and *N*,*S*-acetals **3**−**5** were prepared in order to examine the effect of electronic and steric factors on the metalation of these acetals and their subsequent addition to electrophiles (Scheme 1). Compound **2** was obtained in 72% yield from oxazolidinone **1** by N-alkylation with chloromethyl methyl ether (MOMCl).[40] For the synthesis of compounds **3**−**5**, we chose to employ a procedure developed for the protection of OH groups as methylthiomethyl ethers (MTM ethers).[41] Thus, treatment of oxazolidinone **1** with BuLi, NaI, and the corresponding chloromethyl sulfide[42] in DME at 0 °C afforded the desired *N*,*S*-acetals

**Scheme 1**

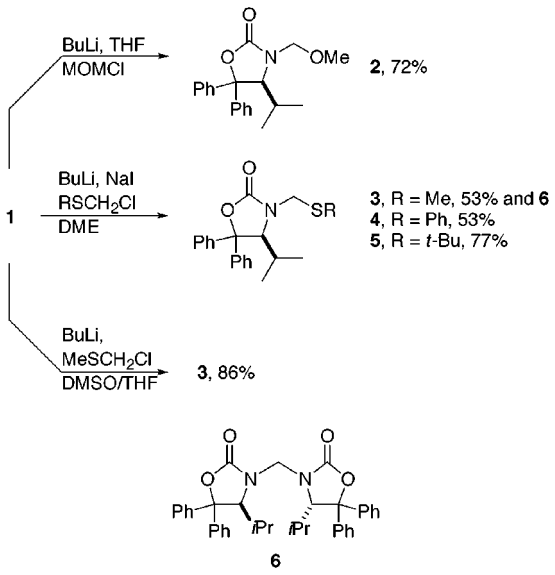
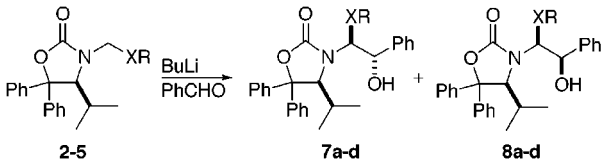



**Table 1. Addition of Lithiated Acetals 2−5 to Benzaldehyde under Varying Reaction Conditions**




| | | | | products **7**, **8** | | |
|---|---|---|---|---|---|---|
| entry | substrate | XR | conditions[a] | | yield[b] (%) | dr (**7**/**8**)[c] |
| 1 | **2** | OMe | A | **a** | *d* | |
| 2 | **3** | SMe | A | **b** | 86 | 90:10 |
| 3 | **4** | SPh | A | **c** | 71[e] | 95:5[e] (91:9)[c] |
| 4 | **5** | S-*t*-Bu | A | **d** | *f* | |
| 5 | **3** | SMe | B | **b** | 92 | 85:15 |
| 6 | **3** | SMe | C | **b** | 90 | 93:7 |

[a] Key: (A) THF, −78 °C; (B) $Et_2O$, −78 °C; (C) THF, −100 °C. [b] Combined yield of both isomers after FC. [c] Determined by $^1H$ NMR (300 MHz) of the crude product. [d] No reaction. [e] Yield (95% purity)/dr obtained/determined after trituration in hexane. [f] Complex mixture of products.

**3**−**5** in good yields (Scheme 1). Interestingly, "dimer" **6** was isolated as a side product only when chloromethyl methyl sulfide (MTMCl) was used as alkylating reagent (**3** and **6** as a 4:1 mixture). Presumably, compound **6** results from the reaction of product **3** with Li-**1**, whereas the sterically more demanding sulfur substituents of products **4** and **5** prevent the attack by Li-**1**. The undesired side reaction could be suppressed by using DMSO/THF (5:1) as solvent; *N*,*S*-acetal **3** was formed in 86% yield as the exclusive product.

**Lithiation and Addition of Oxazolidinone Derivatives 2−5 to Electrophiles.** Acetals **2**−**5** were treated sequentially with BuLi and benzaldehyde in THF at −78 °C (Table 1, entries 1−4). In the case of *N*,*O*-acetal **2**, only starting material was recovered (cf. entry 1). Not surprisingly, compound **2** could not be lithiated under

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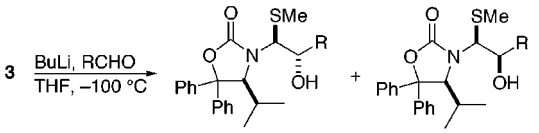
**Table 2. Addition of Lithiated Metylthiomethyl Oxaolidinone 3 to Aldehydes**



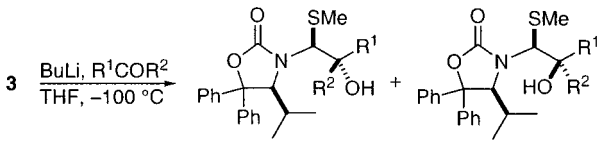

| | | products **9**, **10** | | |
|---|---|---|---|---|
| entry | R | | yield[a] (%) | dr (**9**/**10**)[b] |
| 1 | 2-naphthyl | **a** | 87 | 91:9 |
| 2 | 4-(MeO)$C_6H_4$ | **b** | 92 | 91:9 |
| 3 | 3-(TBSO)$C_6H_4$ | **c** | 91 | 91:9 |
| 4 | 4-(NC)$C_6H_4$ | **d** | 77[c] | 85:15 |
| 5 | furfuryl | **e** | 90 | 90:10 |
| 6 | 2-thiophenyl | **f** | 92 | 92:8 |
| 7 | 1-methyl-2-pyrrolyl | **g** | 81[d] | 91:9[d] (83:17)[b] |
| 8 | 3-pyridinyl | **h** | 72[d] | 96:4[d] (84:16)[b] |
| 9 | phenylpropargyl | **i** | 80[e] | 93:7 |
| 10 | (*E*)-PhCH=CH | **j** | 91 | 86:14 |
| 11 | $CH_2$=CMe | **k** | 88 | 85:15 |
| 12 | 1-cyclopentenyl | **l** | 84 | 86:14 |
| 13 | *i*-Pr | **m** | 84 (61)[e] | 71:29 |
| 14 | Pr | **n** | 83 | 70:30 |

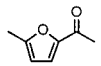
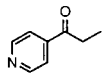
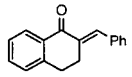
[a] Combined yield of both isomers after FC. [b] Determined by $^1$H NMR (300 MHz) of the crude product. [c] Only 88% conversion. [d] Yield/dr obtained/determined after recrystallization from MeOH. [e] Yield of the major isomer (dr 99:1) after FC.

these reaction conditions.[43] With *N*,*S*-acetals **3** and **4**, however, the reaction proceeded efficiently to afford adducts **7b** and **7c** in high yields and very good stereoselectivities (cf. entries 2 and 3). In each case, only two of the four possible diastereoisomers were formed. Major isomers **7** and minor isomers **8** have the same configuration at C(1)-SR and are epimeric at C(2)-OH.[44] Attempted lithiation and addition of *N*,*S*-acetal **5** to benzaldehyde resulted in a complex mixture of products (cf. entry 4). As illustrated by the data in Table 1, the optimal protocol involves lithiation of *N*,*S*-acetal **3** with BuLi in THF at −78 °C and subsequent addition of benzaldehyde at −100 °C (cf. entry 6); adduct **7b** was isolated in 90% yield as a 93:7 mixture with its C(2)-OH epimer **8b**.

In Table 2, we have summarized the results of our studies on the addition reaction of the lithiated methylthiomethyl oxazolidinone **3** to various aldehydes. While the yield of the reaction is very high for all aldehydes—products **9**/**10** were isolated in 72−92% combined yield—the stereoselectivity is dependent on the type of aldehyde.[44] Thus, Li-**3** adds smoothly to aromatic, heteroaromatic, and propargylic aldehydes (cf. entries 1−9) with diastereoselectivities greater than 90%, while the adducts with α,*β*-unsaturated aldehydes are usually formed somewhat less selectively (cf. entries 10−12) (products resulting from 1,4-addition were not detected). The addition to aliphatic aldehydes is also high yielding, but the selectivities are lower (cf. entries 13 and 14). Fortunately, competing enolization of the aliphatic aldehydes by Li-**3** was not observed. The diastereoisomeric products **9** and **10** from aliphatic, α,*β*-unsaturated, and propargylic aldehydes can usually be separated by flash chromatography, with the major isomer eluting first. In the case of aromatic aldehydes, diastereoisomeric products **9** and **10** were separated by recrystallization from MeOH. Furthermore, simple trituration of the crude products in hexane afforded cleanly mixtures of **9** and **10** with enhanced diastereoisomer ratios.

**Table 3. Addition of Lithiated Methylthiomethyl Oxazolidinone 3 to Ketones**




| | | | product **11** | | |
|---|---|---|---|---|---|
| entry | $R^1COR^2$ | conversion | | yield[a] (%) | dr (**11**/**12**)[b] |
| 1 | PhCOMe | 89 | **a** | 60 | 91:9 |
| 2 | $PhCOCF_3$ | >99 | **b** | 55 | 78:22 |
| 3 |  | 97 | **c** | 85[c] | 72:28 |
| 4 |  | 95 | **d** | 73 | 91:9 |
| 5 |  | 70 | **e** | 64[d] | 94:6 |
| 6 |  | 95 | **f** | 76 | 95:5 |
| 7 |  | 82 | **g** | 59 | 91:9 |
| 8 |  | 97 | **h** | 25[e] | *f* |
| 9 |  | 80 | **i** | 51[g] | 80:20 |
| 10 |  | 63 | **j** | *f* | 77:23 |
| 11 |  | 72 | **k** | *f* | 62:38 |

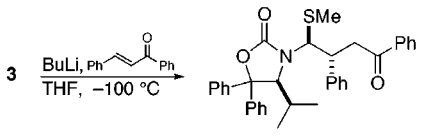
[a] Yield of the major isomer (dr ≥ 98:2). [b] Determined by $^1$H NMR (300 MHz) of the crude product. [c] Yield of a 77:23 mixture. [d] Yield of a 97:3 mixture. [e] Moderate yield due to difficult purification. [f] Not determined. [g] Yield of a 83:17 mixture.

We next turned our attention to the reaction of Li-**3** with unsymmetrical ketones $R^1COR^2$. Adducts to ketones with their newly created tertiary stereocenters would be synthetically especially valuable intermediates. As is evident from the data in Table 3, Li-**3** adds particulary effectively to (hetero)aryl/alkyl ketones (cf. entries 1−7).[44] The major isomers **11** were isolated in 55−76% yield (dr ≥ 98:2) after recrystallization from MeOH or trituration in MeOH. The diastereoselectivities are excellent,

(43) Gilman, H.; Webb, F. J. *J. Am. Chem. Soc.* **1949**, *71*, 4092.

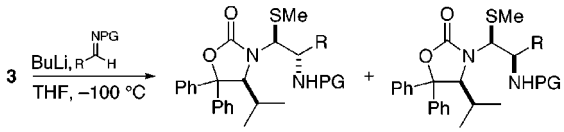
(44) The relative configuration of adducts **9d**,**e**, **10m**, **11a**,**e**,**i**−**k**, **15d**, of acyloxazolidinones **30**, **31**, and of *N*,*O*-acetal **37** was unambiguously assigned by single-crystal X-ray diffraction. Additionally, the configuration at C(2)-OH of adducts **7b**, **9m**, **11a** and the configuration at C(1)-NH of adduct **14c** were confirmed by optical comparison of compounds **21**, **23**, **24**, and **25** with the data reported in the literature. The X-ray structures, similarities of NMR data, and comparison of $R_f$ values of major and minor products led to configurational assignment of the other compounds by analogy (see formulas in the schemes and tables).

**Scheme 2**




**13**, 79%, dr 98:2

**Table 4. Addition of Lithiated Methylthiomethyl Oxazolidinone 3 to Imine Derivatives**




**14a-d** **15a-d**

| | | | | products **14**, **15** | |
|---|---|---|---|---|---|
| entry | PG | R | | yield[a] (%) | dr (**14**/**15**)[a] |
| 1 | −P(O)Ph$_2$ | Ph | **a** | 44 | 97:3 |
| 2 | −SO$_2$Tol | Ph | **b** | 67 | 75:25 |
| 3 | −SO$_2$Mes | Ph | **c** | 62 | 95:5 |
| 4 | −SO$_2$Mes | *i*-Pr | **d** | 43[b] | 3:97 |

[a] Yield/dr obtained/determined after FC or trituration in MeOH. [b] 95% purity after FC.

even surpassing the selectivities found with aldehydes in some cases (cf. entries 5 and 6). Only highly reactive ketones (cf. entry 2) or ketones with sterically similar R$^1$ and R$^2$ groups (cf. entry 3) reacted with diminished selectivities. The addition to alkenyl/alkyl ketones and alkyl/alkyl ketones proceeded in lower conversion/yield and selectivity (cf. entries 9−11). The incomplete conversion is due to competing enolization of these ketones by Li-**3**. Note that the conversion with (hetero)aryl/alkyl ketones is considerably higher, although their α-carbonyl hydrogens are more acidic. This surprising result might be due to a favorable interaction of the phenyl rings of **3** with the aryl group of the ketones.[45]

Furthermore, Li-**3** displayed a remarkable reactivity toward benzalacetophenone. Product **13** of conjugate addition was obtained in 79% yield as a 98:2 mixture with its C(2)-Ph epimer after flash chromatography (Scheme 2).[44] 1,2-Adducts were formed in only 9% yield (by $^1$H NMR spectroscopy of the crude product). This result is in sharp contrast to the outcome of the reaction of Li-**3** with 2-benzylidene-1-tetralone, in which only the 1,2-adduct **11h** was isolated (cf. Table 3, entry 8).

We then investigated the behavior of several imine derivatives in the addition reaction (Table 4). *N*-Diphenylphosphinoylimines and *N*-tolyl- and *N*-mesitylsulfonylimines are known to be particulary suitable for enantio- and diastereoselective reactions with nucleophiles.[46] Therefore, we prepared the benzaldehyde-derived phosphinoyl- and sulfonylimines[47] and tested them in the reaction with Li-**3** (cf. entries 1−3).[44] Best results were achieved with the *N*-mesitylsulfonylimine: Major isomer **14c** was obtained in 62% yield as a 95:5 mixture with its C(1)-NH epimer after trituration of the crude product in MeOH. Unexpectedly, the diastereoselectivity of the reaction was reversed in the addition of Li-**3** to the *N*-mesitylsulfonylimine derived from isobutyraldehyde (cf. entry 4), furnishing adduct **15d** in 43% yield.[44]

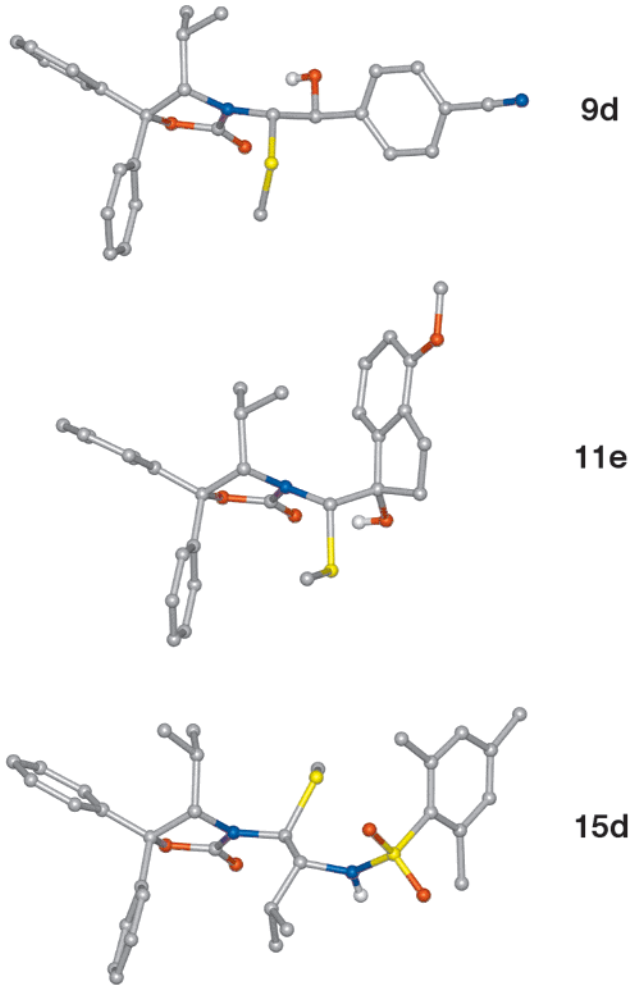



**Figure 5.** X-ray crystal structures of products **9d**, **11e**, and **15d**. N: blue. O: red. S: yellow.

We were able to obtain single crystals of a number of products of type **7**−**15** suitable for structure determination by X-ray crystallography.[44] The X-ray crystal structures of major adducts **9d**, **11e**, and **15d** are depicted in Figure 5 as selected examples. Referring to the two newly created stereocenters, **9d** and **11e** have (*S*,*S*)- or *l*-configuration. Hence, the new C,C-bond is formed with the relative topicity *ul*. X-ray crystal structure analysis of several other aldehyde and ketone adducts revealed the same stereochemical course of formation of the major isomer.

Based on the data obtained by X-ray crystallography, a simple model for the stereochemical course of the reaction may be suggested (Figure 6).[48] The intermediate organolithium species Li-**3** may have a defined five-membered ring chelate structure,[49] with the *i*-Pr and the MeS substituent being on opposite sides of a bicyclic system. In the formation of the major product, the

(45) A similar effect of these phenyl groups had been observed previously.[33]

(46) (a) Soai, K.; Hatanaka, T.; Miyazawa, T. *J. Chem. Soc., Chem. Commun.* **1992**, 1097. (b) Reference 8c,d.

(47) The phosphinoylimine was prepared according to: Jennings, W. B.; Lovely, C. J. *Tetrahedron* **1991**, *47*, 5561. The sulfonylimines were prepared according to: Chemla, F.; Hebbe, V.; Normant, J. F. *Synthesis* **2000**, 75.

(48) This model is consistent with observations made by Pearson[29] and Nakai.[30]

(49) The structure of Li-**3** is drawn arbitrarily; the configuration of the lithiated carbon is unknown. Cf. the X-ray crystal structure of a 1-bromomagnesio-2-pivaloyltetrahydroisoquinoline.[19a]

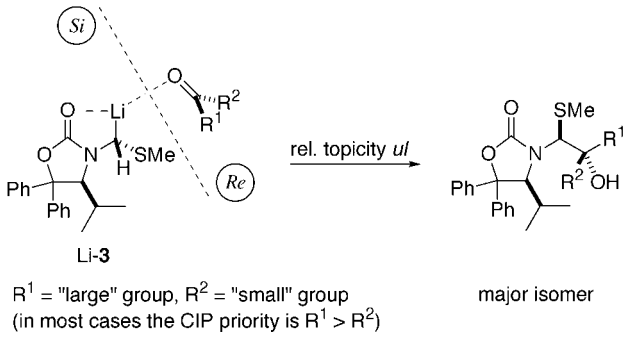
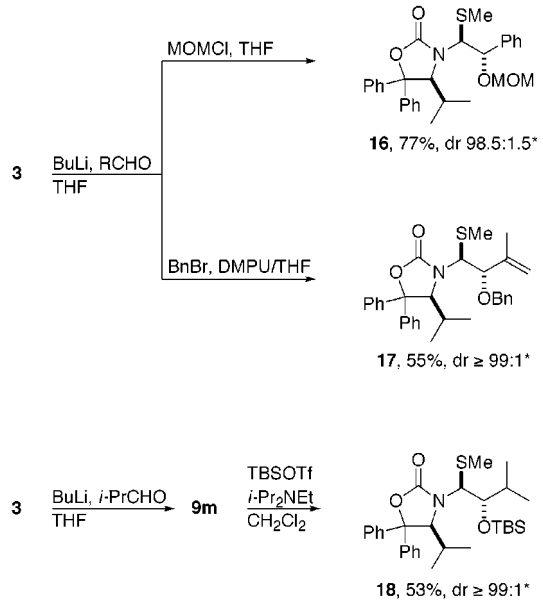



**Figure 6.** Proposed model for the stereochemical course of the addition of Li-**3** to aldehydes and ketones.

**Scheme 3**[a]

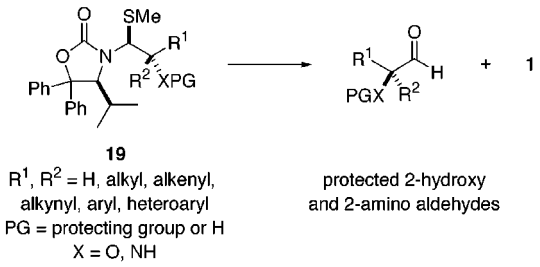



[a] Key: * yield/dr obtained/determined after purification.

aldehyde or ketone would then approach the C,Li-bond with its *Re* face to avoid steric repulsion between the $R^1$ and the MeS group. The proposed model is consistent with the stereochemical course of the addition reaction of Li-**3** to aldehydes and ketones, but cannot be applied to the preferred mode of reaction with imine derivatives (cf. Table 4, entries 3 and 4, and Figure 5, **15d**). In this case, an appropriate model is expected to be more complex, since it is very likely that the phosphinoyl and sulfonyl groups also coordinate to lithium via their oxygen atoms.

To further extend the scope of the reaction, the in situ OH protection of the aldehyde adducts was examined (Scheme 3). Consecutive addition of benzaldehyde and MOMCl to a solution of Li-**3** afforded the MOM-protected benzaldehyde adduct **16**. Similarly, the initially formed methacrolein adduct reacted in situ with BnBr to give **17**. However, the use of *N*,*N*′-dimethylpropyleneurea (DMPU) as a cosolvent was necessary for an efficient introduction of the benzyl protecting group. Presumably, DMPU enhances the reactivity of the in situ generated Li-alkoxide by coordinating to lithium.[50] In the case of isobutyraldehyde, we were unable to perform the addition reaction and the protecting step (with MOMCl, BnBr as well as AcCl) in a one-pot procedure. Therefore, the major isobutyraldehyde adduct **9m** was first isolated and then

**Scheme 4**




treated with *tert*-butyldimethylsilyl triflate (TBSOTf) in $CH_2Cl_2$ to afford **18** in 53% overall yield (dr ≥ 99:1) from oxazolidinone **3**. The in situ OH protection of the ketone adducts has never been attempted by us; it probably requires highly reactive protecting reagents, since the tertiary alcohols (alkoxides) are sterically severely crowded.

**Conversion of Adducts 19 to Synthetically Valuable Chiral Building Blocks.** At this point, the hydrolysis of the *N*,*S*-acetal moiety in the products **19**, which is crucial to the usefulness of the diastereoselective addition of Li-**3** to electrophiles, was envisaged. We intended to convert adducts **19** to protected 2-hydroxy and 2-amino aldehydes with recycling of the chiral auxiliary **1** (Scheme 4). Several desulfurization reagents such as $HgCl_2$, $AgNO_3$, $CuCl_2$, NBS, or MeI were tested, but all of them led to either complex product mixtures or to no reaction at all. In first successful experiments, treatment of *N*,*S*-acetals **19** with bis(trifluoroacetoxy)-iodobenzene[51] in MeOH cleanly furnished the analogous *N*,*OMe*-acetals. To our disappointment, we were unable to hydrolyze them. Similarly, $Hg(OAc)_2$-assisted hydrolysis of *N*,*S*-acetals **19** in THF/MeCN (1:1) yielded the corresponding *N*,*OAc*-acetals, which also resisted our attempts of cleavage to the desired aldehydes and auxiliary **1**.[52]

To our delight, treatment of protected and unprotected adducts **19** with $Hg(O_2CCF_3)_2$ in MeCN/THF/$H_2O$ (2:2:1) at room temperature gave the corresponding hemiaminals **20** within 5 min (cf. a in Scheme 5). Since these hemiaminals were rather sensitive to decomposition, they were used for further transformations without purification.[53] NMR experiments in $CDCl_3$ provided evidence that hemiaminals **20** collapse instantaneously to the corresponding aldehydes and oxazolidinone **1** upon addition of 1,8-diazabicyclo[5.4.0]undec-7-ene (DBU). Interestingly, compounds **20** were stable in the presence of $Et_3N$ or Hünig's base. As chiral enolizable 2-hydroxy and 2-amino aldehydes are fairly susceptible to racemization, dimerization (reversible) and air oxidation, it is desirable to convert them in situ into chemically stable

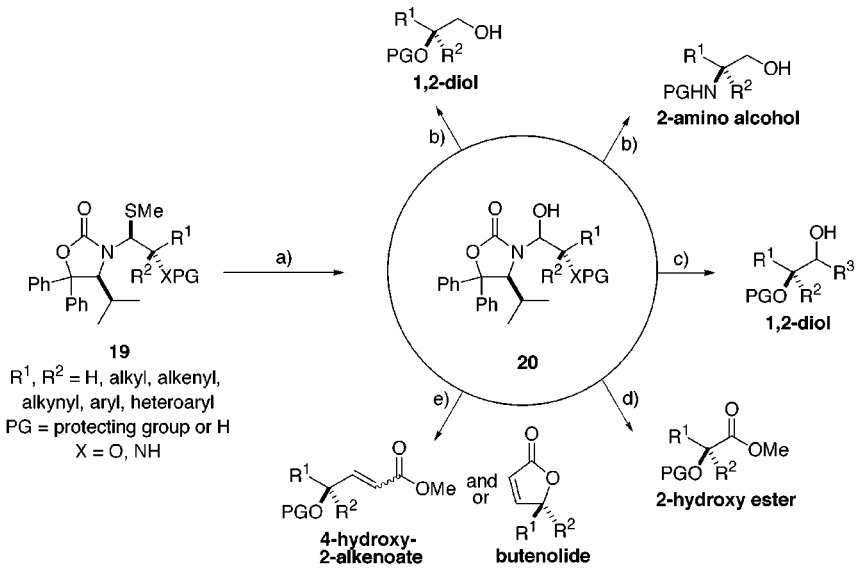
(50) For nucleophilicity enhancement in the presence of DMPU, see: (a) Beck, A. K.; Seebach, D. In *Encyclopaedia of Reagents in Organic Chemistry*; Paquette, L. A., Ed.; John Wiley & Sons: New York, 1995; Vol. 3, p 2123. (b) Mukhopadhyay, T.; Seebach, D. *Helv. Chim. Acta* **1982**, *65*, 385. (c) Seebach, D.; Maestro, M. A.; Sefkow, M.; Neidlein, A.; Sternfeld, F.; Adam, G.; Sommerfeld, T. *Helv. Chim. Acta* **1991**, *74*, 2112. (d) Seebach, D.; Maestro, M. A.; Sefkow, M.; Adam, G.; Hintermann, S.; Neidlein, A. *Liebigs Ann. Chem.* **1994**, 701. (e) Lipshutz, B. H.; Moretti, R.; Crow, R. *Tetrahedron Lett.* **1989**, *30*, 15.

(51) Stork, G.; Zaho, K. *Tetrahedron Lett.* **1989**, *30*, 287.

(52) For similar observations, see: Sarma, D. N.; Barua, N. C.; Sharma, R. P. *Chem. Ind. (London)* **1984**, 223.

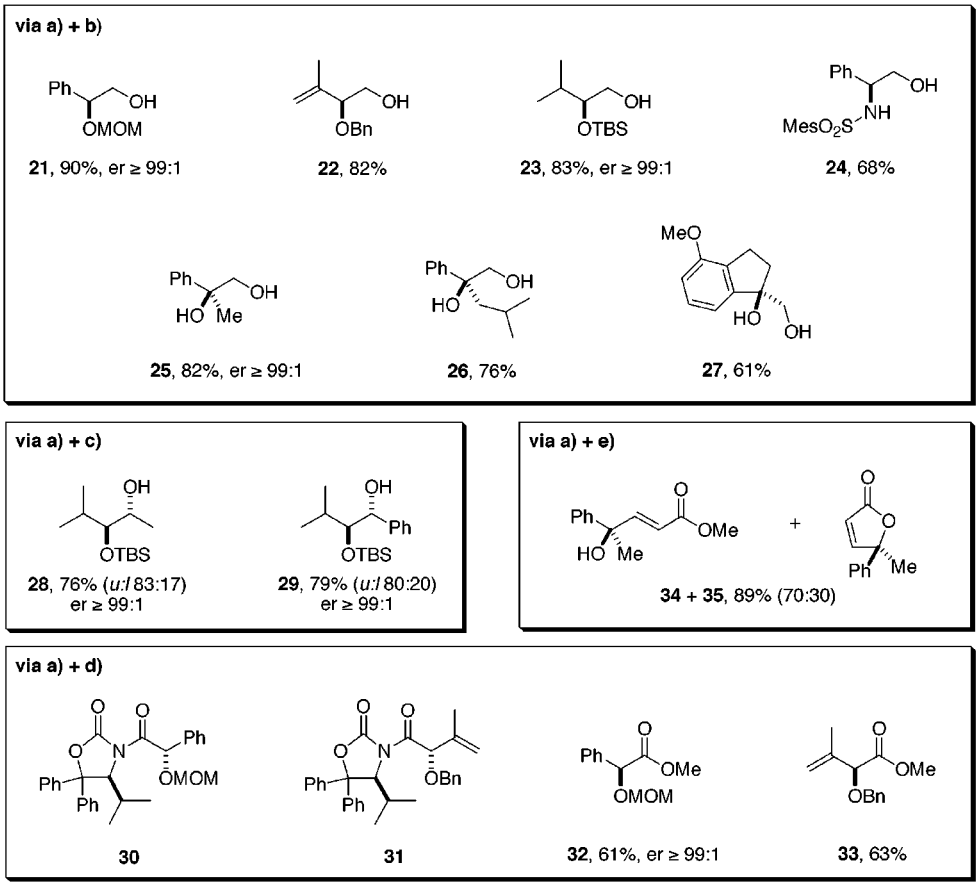
(53) For oxazolidinone-derived hemiaminals, see: (a) Bach, J.; Bull, S. D.; Davies, S. G.; Nicholson, R. L.; Sanganee, H. J.; Smith, A. D. *Tetrahedron Lett.* **1999**, *40*, 6677. (b) Bull, S. D.; Davies, S. G.; Nicholson, R. L.; Sanganee, H. J.; Smith, A. D. *Tetrahedron*: *Asymmetry* **2000**, *11*, 3475.

**Scheme 5**




a) $Hg(O_2CCF_3)_2$, THF/MeCN/$H_2O$ (2:2:1), rt, 5 min; b) $NaBH_4$, DBU, THF/$H_2O$ (4:1), 0 °C; c) $R^3M$, THF, –78 °C to rt; d) 1. PCC, Celite, $CH_2Cl_2$, rt 2. LiBr, DBU, MeOH, 0 °C; e) DBU, $Ph_3PCHCO_2Me$, rt.

**Selected examples** (Yields from **19**, auxiliary **1** is recycled by simple filtration in 70-90% for all transformations):




products such as (selectively protected) 1,2-diols, 2-amino alcohols, 2-hydroxy esters or 4-hydroxy-2-alkenoates (cf. b–e in Scheme 5). After extensive experimentation, a variety of **procedures** were developed that do not require the isolation of these sensitive aldehydes but make use of the synthetically valuable intermediate aldehyde functionality.

**Procedure 1.** Hemiaminals of type **20** are dissolved in THF/$H_2O$ (4:1) and treated consecutively with $NaBH_4$ and DBU at 0 °C, yielding (selectively protected) 1,2-diols or 2-amino alcohols (cf. b in Scheme 5). Following this procedure, compounds **21**–**27** were obtained in 61–90% yield (from **19**). The enantiopurities of **21**, **23**, and **25** were determined by GC, indicating that no detectable racemization had occurred during the reduction. It is reasonable to assume that the diol and amino alcohol derivatives **22**, **24**, **26**, and **27** are also enantiopure, since they were obtained under the same reaction conditions.

**Procedure 2.** Slow addition of organolithium or Grignard reagents to a solution of hemiaminals **20** in THF at −78 °C furnishes—in a C,C-bond-forming process and with the generation of a new stereocenter—1,2-diols (cf. c in Scheme 5). The selectively protected diols **28** and **29** were thus prepared in 76% and 79% yield (from **19**) as ca. 4:1 mixtures with their C(2)-OH epimers. The enantiopurities of **28** and **29** were determined by GC to be ≥99:1. The relative configuration of the major isomers was established using NOE difference analysis carried out on the corresponding dioxolane derivatives. Each of the major isomers was formed by a nonchelating addition reaction of the C-nucleophile to the in situ generated 2-siloxy aldehyde. Perhaps, significantly higher and "opposite" diastereoselectivities can be accomplished when chelating OH-protecting groups such as Bn or MOM ethers are employed.[54]

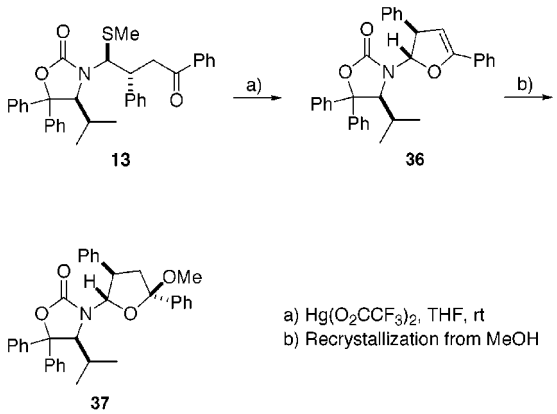
**Procedure 3.** It is also possible to oxidize the crude hemiaminals **20** by PCC in $CH_2Cl_2$, yielding the corresponding acyloxazolidinones, which then can be cleaved to protected 2-hydroxy esters or other 2-hydroxy or 2-amino carboxylic acid derivatives by numerous methods[55] (cf. d in Scheme 5). Thus, PCC oxidation, followed by methanolysis (LiBr, DBU, MeOH) of the acyloxazolidinones **30** and **31** (derived from **16** and **17**, respectively), provided 2-alkoxy methylesters **32** and **33** in 61% and 63% yield and in enantiomerically pure form (determined for compound **32** by HPLC.

**Procedure 4.** Consecutive addition of DBU and a stabilized phosphorus ylide to a solution of hemiaminals **20** in $CH_2Cl_2$ at room temperature produces 4-hydroxy-2-alkenoates and/or butenolides via a Wittig reaction (cf. e in Scheme 5). This procedure was applied to obtain the 4-hydroxy-2-alkenoate **34** and the butenolide **35**, which were isolated as single enantiomers (racemization of the tertiary stereocenters is not possible!) and in excellent yield. In particular, the enantioselective synthesis of butenolides is of great interest, since they are part of numerous natural products. Treatment of hemiaminals **20** with the Ando or Still reagent[56] (highly *Z*-selective Horner−Emmons reagents) should directly afford a variety of substituted butenolides in enantiopure form.

Importantly, all processes described above involve recycling of the chiral auxiliary **1**. Usually, oxazolidinone **1** precipitates in the course of these transformations and is recovered in 70−90% yield, ready for the next use by simple filtration, washing, and drying.

Experiments aimed at extending this strategy to the elaboration of 1,4-adduct **13** have not been fruitful thus far. When compound **13** was treated with $Hg(O_2CCF_3)_2$ in MeCN/THF/$H_2O$ (2:2:1), a ca. 1:1 mixture of the desired hemiaminal and enolether **36** was isolated. If the same reaction was carried out under nonaqueous conditions, compound **36** was obtained as the sole product as a single diastereoisomer (Scheme 6). Obviously, enol ether **36** is derived from an intramolecular attack of the intermediate acyliminium ion by the carbonyl oxygen of the phenyl ketone moiety. Recrystallization of **36** from

**Scheme 6**




MeOH yielded single crystals of *N*,*O*-acetal **37**. X-ray crystal structure analysis of **37** revealed the configuration of the three newly created stereocenters as shown in Scheme 6.

We have also tested the scope of the method presented here and compared our reagent **3** with analogs of different substitution on the oxazolidinone ring (Scheme 7). Thus, the branched precursor **38**, obtained as a 83:17 mixture of diastereoisomers by methylation of Li-**3**, and the *tert*-leucine-, phenylglycin-, and leucine-derived methylthiomethyl derivatives **39**, **40,** and **41**, all prepared analogously to compound **3**, were submitted to the standard reaction conditions (BuLi, PhCHO, THF, −78 °C). The results are summarized in Scheme 7 and show (i) that branching at the acetal carbon (**38**) is "allowed", but leads to a nonstereoselective reaction (products **42** and **43**), (ii) that the *tert*-butyl substituent of **39** does not improve diastereoselectivity (product **44**), (iii) that the triphenyl derivative **40** adds with poorer diastereoselectivity (product **45**), and (iv) that the "*trans*"-phenyl group in reagent **3** does not have a negative impact on the diastereoselectivity in the addition reaction, since the use of the *cis*-oxazolidinone **41** is not advantageous compared to oxazolidinone **3** (product **46**).

## Conclusions

We have developed a novel chiral oxazolidinone-derived reagent Li-**3** for the enantioselective nucleophilic formylation of carbonyl compounds. Treatment of methylthiomethyl oxazolidinone **3** with BuLi in THF and subsequent addition of an aldehyde, ketone, or imine derivative affords adducts **19** in high yields and good to excellent stereoselectivities. Hydrolysis of adducts **19** under mild conditions yields enantiomerically pure (selectively protected) 2-hydroxy and 2-amino aldehydes that are reduced, oxidized, or treated with C-nucleophiles in situ to give (protected) 1,2-diols, 2-amino alcohols, 2-hydroxy esters, or 4-hydroxy-2-alkenoates. This sequence represents a new and more practical alternative to existing methodologies for the enantioselective nucleophilic formylation of carbonyl compounds. Experiments to elucidate the solution structure of Li-**3** and to extend the presented methodology to conjugate addition of Li-**3** to enones are currently underway in our laboratories.

## Experimental Section

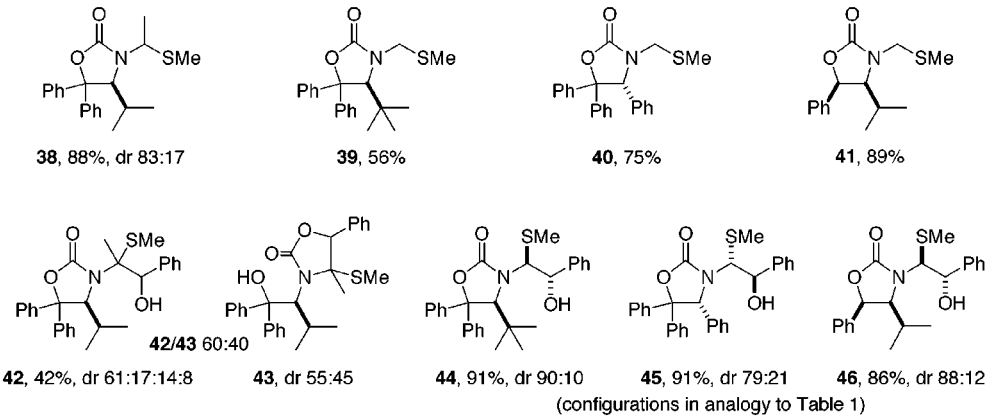
**General Information.** All reactions involving air- or moisture-sensitive reagents or intermediates were carried out in heat-gun dried glassware under an argon atmosphere.

(54) For a review, see: Reetz, M. T. *Angew. Chem., Int. Ed. Engl.* **1984**, *23*, 556.

(55) For examples, see: (a) Evans, D. A.; Britton, T. C.; Ellman, J. A. *Tetrahedron Lett.* **1987**, *28*, 6141. (b) Damon, R. E.; Coppola, G. M. *Tetrahedron Lett.* **1990**, *31*, 2849. (c) Reference 33.

(56) (a) Ando, K.; Oishi, T.; Hirama, M.; Ohno, H.; Ibuka, T. *J. Org. Chem.* **2000**, *65*, 4745. (b) Ando, K. *J. Org. Chem.* **1998**, *63*, 8411. (c) Ando, K. *J. Org. Chem.* **1997**, *62*, 1934. (d) Still, W. C.; Gennari, C. *Tetrahedron Lett.* **1983**, *24*, 4405.

**Scheme 7**




Tetrahydrofuran (THF) was freshly distilled from potassium under argon. Diethyl ether ($Et_2O$) was freshly distilled from sodium under argon. Dichloromethane ($CH_2Cl_2$) and dimethyl sulfoxide (DMSO) were distilled from calcium hydride ($CaH_2$) and stored under argon over activated 4 Å molecular sieves. DME was stored over potassium hydroxide (KOH) pellets. Diisopropylethylamine ($(i\text{-Pr})_2NEt$), *N*,*N*′-dimethylpropyleneurea (DMPU), and 1,8-diazabicyclo[5.4.0]undec-7-ene (DBU) were distilled from $CaH_2$ and stored under argon. All liquid aldehydes and ketones were distilled. Lithium bromide (LiBr) was dried in a Kugelrohr apparatus at 150 °C under high vacuum. All other reagents were used as received from Aldrich or Fluka. Flash column chromatography (FC) was performed using Fluka silica gel (40−63 $\mu$m). Melting points (mp) are uncorrected. Coupling constants are reported in Hz. Elemental analyses were performed by the Microanalytical Laboratory of the Laboratorium für Organische Chemie, ETH Zürich. Diastereoisomeric ratios were determined by $^1H$ NMR.

**General Procedure 1 (GP 1) for the Methylthiomethylation of Oxazolidinones.** To a solution (or suspension) of oxazolidinone (1 equiv) in THF (1 M) was added BuLi (1.05 equiv) at 0 °C. After the solution was stirred for 10 min, DMSO (5-fold excess compared to the amount of THF) and chloromethyl methyl sulfide (MTMCl) (1.2 equiv) were added consecutively to the reaction mixture. After being stirred for 4 h at room temperature, the reaction mixture was quenched with saturated aqueous $NH_4Cl$ solution and diluted with $Et_2O$. The organic layer was separated, and the aqueous layer was extracted with $Et_2O$ (2×). The combined organic layers were washed with $H_2O$ (1×), dried ($MgSO_4$), and concentrated under reduced pressure. The crude product was purified by FC.

**General Procedure 2 (GP 2) for the Addition of *N*,*S*-Acetals to Aldehydes, Ketones, and Imine Derivatives.** To a solution of *N*,*S*-acetal (1 equiv) in THF (0.2 M) or $Et_2O$ (0.2 M) was added BuLi (1.2 equiv) at −78 °C. After being stirred for 5 min, the reaction mixture was cooled to −100 °C (or kept at −78 °C), and an aldehyde, ketone, or imine derivative (1.3 equiv) was added dropwise neat or as a solution in THF (ca. 1 M) or $Et_2O$ (ca. 1 M). It was allowed to warm to −78 °C within 20 min, and then the reaction was stopped by quenching with saturated aqueous $NH_4Cl$ solution. The reaction mixture was diluted with $Et_2O$, the organic layer was separated, and the aqueous layer was extracted with $CH_2Cl_2$ (2×). The combined organic layers were dried ($MgSO_4$) and concentrated under reduced pressure. The crude product was purified by trituration, FC, or recrystallization.

**General Procedure 3 (GP 3) for the Transformation of Addition Products to 1,2-Diols Using $Hg(O_2CCF_3)_2$/$NaBH_4$/DBU.** To a solution (or suspension) of addition product (1 equiv) in THF/MeCN/$H_2O$ (2:2:1; 0.1 M) was added $Hg(O_2CCF_3)_2$ (1.1 equiv) at room temperature. After the mixture was stirred for 5 min, $H_2O$ was added, and then the reaction mixture was diluted with $Et_2O$. The organic layer was separated, and the aqueous layer was extracted with $Et_2O$ (2×). The combined organic layers were dried ($MgSO_4$) and concentrated under reduced pressure. The crude product was dissolved in THF/$H_2O$ (4:1, 0.15 M), and $NaBH_4$ (0.75 equiv) and DBU (0.5 equiv) were added consecutively at 0 °C. The auxiliary **1** precipitated in the course of the reaction. After the mixture was stirred for 15 min, saturated aqueous $NH_4Cl$ solution and $Et_2O$ were added, and the precipitate was filtered off. The precipitate was washed with saturated aqueous $NH_4Cl$ solution, $H_2O$, and $Et_2O$ and dried under high vacuum to recover **1** as a white solid. The filtrate was diluted with $Et_2O$, the organic layer was separated, and the aqueous layer was extracted with $Et_2O$ (2×). The combined organic layers were dried ($MgSO_4$) and concentrated under reduced pressure. The crude product was purified by FC.

**General Procedure 4 (GP 4) for the Transformation of Addition Products to 1,2-Diols Using $Hg(O_2CCF_3)_2$/RLi or RMgCl.** A solution (or suspension) of addition product (1 equiv) in THF/MeCN/$H_2O$ (2:2:1; 0.1 M) was treated with $Hg(O_2CCF_3)_2$ (1.1 equiv) according to GP 3. The crude product was dissolved in THF (0.25 M), and RLi (4 equiv) or RMgCl (4 equiv) was added at −78 °C. After the mixture was stirred for 10 min at −78 °C, the cooling bath was removed, and the mixture was stirred for another 10 min. The auxiliary **1** precipitated in the course of the reaction. Then, saturated aqueous $NH_4Cl$ solution and $Et_2O$ were added and the precipitate was filtered off. The precipitate was washed with saturated aqueous $NH_4Cl$ solution, $H_2O$, and $Et_2O$ and dried under high vacuum to recover **1** as a white solid. The filtrate was diluted with $Et_2O$, the organic layer was separated, and the aqueous layer was extracted with $Et_2O$ (2×). The combined organic layers were dried ($MgSO_4$) and concentrated under reduced pressure. The crude product was purified by FC.

**General Procedure 5 (GP 5) for the Transformation of Addition Products to *N*-Acyloxazolidinones.** A solution (or suspension) of addition product (1 equiv) in THF/MeCN/$H_2O$ (2:2:1; 0.1 M) was treated with $Hg(O_2CCF_3)_2$ (1.1 equiv) according to GP 3. The crude product was dissolved in $CH_2Cl_2$ (0.15 M) and treated with PCC (2.1 equiv) and powdered 4 Å molecular sieves (1 weight equiv to PCC) at room temperature. After being stirred for 2.5 h, the reaction mixture was diluted with $Et_2O$ and filtered through a silica plug eluting with pentane/$Et_2O$ (1:1). The crude product was purified by FC or recrystallization.

**General Procedure 6 (GP 6) for the Methanolysis of *N*-Acyloxazolidinones to 2-Hydroxy Methylesters.** To a solution of *N*-acyloxazolidinone (1 equiv) in MeOH/THF (2:1, 0.15 M) were added DBU (2 equiv) and LiBr (5 equiv) consecutively at 0 °C. The auxiliary **1** precipitated in the course of the reaction. After the mixture was stirred for 45 min, saturated aqueous $NH_4Cl$ solution and $Et_2O$ were added and the precipitate was filtered off. The precipitate was washed with saturated aqueous $NH_4Cl$ solution, $H_2O$, and $Et_2O$ and dried under high vacuum to recover **1** as a white solid. The filtrate was diluted with $Et_2O$, the organic layer was separated, and the aqueous layer was extracted with $Et_2O$ (2×). The combined organic layers were dried ($MgSO_4$) and concentrated under reduced pressure. The crude product was purified by FC.

**General Procedure 7 (GP 7) for the Transformation of Addition Products to 4-Hydroxy-2-alkenoates and Butenolides**. A solution (or suspension) of addition product (1 equiv) in THF/MeCN/$H_2O$ (2:2:1; 0.1 M) was treated with $Hg(O_2CCF_3)_2$ (1.1 equiv) according to GP 3. The crude product was dissolved in $CH_2Cl_2$ (0.15 M), and DBU (0.5 equiv) and (methoxycarbonylmethylen)triphenylphosphorane (2 equiv) were added consecutively at room temperature. After the mixture was stirred for 12 h at room temperature, saturated aqueous $NH_4Cl$ solution was added. The organic layer was separated, and the aqueous layer was extracted with $CH_2Cl_2$ (2×). The combined organic layers were dried ($MgSO_4$) and concentrated under reduced pressure. The crude product was triturated in $Et_2O$ for 30 min, and the insoluble material was filtered off, washed with 1 N HCl and $H_2O$, triturated with hexane and $CH_2Cl_2$, and dried under high vacuum to recover **1** as a white solid. The filtrate was concentrated under reduced pressure and purified by FC.

**(*S*)-4-Isopropyl-3-(methoxymethyl)-5,5-diphenyloxazolidin-2-one (2).** To a suspension of **1** (2.00 g, 7.10 mmol) in THF (30 mL) was added BuLi (5.44 mL, 8.16 mmol) at 0 °C. After the mixture was stirred for 10 min, chloromethyl methyl ether (MOMCl) (650 $\mu$L, 8.51 mmol) was added, and the reaction mixture was stirred for 5 h at room temperature. Then the mixture was quenched with saturated aqueous $NH_4Cl$ solution and diluted with $Et_2O$. The organic layer was separated, and the aqueous layer was extracted with $Et_2O$ (2×). The combined organic layers were dried ($MgSO_4$) and concentrated under reduced pressure. The crude product was recrystallized (AcOEt/hexane) to yield **2** (1.66 g, 72%) as a white solid. Mp: 115−117 °C. $[\alpha]^{rt}_D = -183.8$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 2966, 1751, 1600, 1450 $cm^{-1}$. $^1H$ NMR (300 MHz, $CDCl_3$): $\delta$ 0.70 (d, $J = 6.5$, 3 H); 1.05 (d, $J = 7.2$, 3 H); 1.88−2.01 (m, 1 H); 2.86 (s, 3 H); 4.54 (d, $J = 1.9$, 1 H); 4.72 (d, $J = 11.2$, 1 H); 4.83 (d, $J = 11.2$, 1 H); 7.21−7.38 (m, 6 H); 7.43−7.46 (m, 2 H); 7.61−7.64 (m, 2 H). $^{13}C$ NMR (75 MHz, $CDCl_3$): 15.4, 21.9, 29.6, 55.8, 66.5, 76.3, 88.4, 125.3, 126.0, 127.6, 128.1, 128.6, 138.8, 144.1, 157.4. FAB-MS: 282 (7, $[M + H - CO_2]^+$), 250 (100, $[M - OMe - CO_2]^+$). Anal. Calcd for $C_{20}H_{23}NO_3$ (325.41): C, 73.82; H, 7.12; N, 4.30. Found: C, 73.54; H, 7.33; N, 4.39.

**(*S*)-4-Isopropyl-3-(methylsulfanylmethyl)-5,5-diphenyloxazolidin-2-one (3) and (*S*)-4-Isopropyl-3-[[(*S*)-4-isopropyl-2-oxo-5,5-diphenyloxazolin-3-yl]methyl]-5,5-diphenyloxazolidin-2-one (6).** (a) To a suspension of **1** (5.15 g, 18.3 mmol) in DME (40 mL) was added BuLi (14.4 mL, 20.1 mmol) at 0 °C. After the mixture was stirred for 10 min, NaI (2.74 g, 18.3 mmol) and MTMCl (1.89 mL, 18.3 mmol) were added consecutively to the reaction mixture. After being stirred for 12 h at room temperature, the reaction mixture was quenched with saturated aqueous $NH_4Cl$ solution and diluted with $Et_2O$. The organic layer was separated, and the aqueous layer was extracted with $Et_2O$ (2×). The combined organic layers were washed with $H_2O$ (1×), dried ($MgSO_4$), and concentrated under reduced pressure. Compounds **3** and **6** were obtained as a 4:1 mixture, determined by $^1H$ NMR of the crude product. Compounds **3** and **6** were separated by FC (pentane/AcOEt 10:1) to afford **3** (3.28 g, 53%) and **6** (yield not determined). (b) Compound **1** (15.7 g, 55.8 mmol) was treated with BuLi (38.8 mL, 58.6 mmol) and MTMCl (5.60 mL, 67.0 mmol) according to GP 1. The crude product was purified by FC (pentane/$Et_2O$ 5:1) to afford **3** (16.4 g, 86%) as a white solid. Mp: 124−125 °C. $[\alpha]^{rt}_D = -89.6$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 2954, 1744, 1451, 1421, 1041 $cm^{-1}$. $^1H$ NMR (300 MHz, $CDCl_3$): $\delta$ 0.72 (d, $J = 6.5$, 3 H); 1.04 (d, $J = 7.2$, 3 H); 1.37 (s, 3 H); 1.88−2.03 (m, 1 H); 4.06 (d, $J = 14.3$, 1 H); 4.76 (d, $J = 1.9$, 1 H); 4.95 (d, $J = 14.3$, 1 H); 7.20−7.38 (m, 6 H); 7.43−7.49 (m, 2 H); 7.66−7.72 (m, 2 H). $^{13}C$ NMR (75 MHz, $CDCl_3$): $\delta$ 12.9, 15.6, 22.4, 29.7, 48.7, 64.9, 88.3, 125.3, 125.9, 127.5, 128.2, 128.6, 138.7, 144.2, 156.9. FAB-MS: 342 (2, $[M + H]^+$), 294 (12, $[M - SMe]^+$), 250 (100, $[M - SMe - CO_2]^+$). Anal. Calcd for $C_{20}H_{23}NO_2S$ (341.47): C, 70.35; H, 6.79; N, 4.10. Found: C, 70.25; H, 7.08; N, 4.09. **6**. White solid. Mp: 190−192 °C. $[\alpha]^{rt}_D = -152.9$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 2966, 1750, 1493, 1450, 1037. $^1H$ NMR (300 MHz, $CDCl_3$): 0.59 (d, $J = 6.9$, 6 H); 0.89 (d, $J = 7.5$, 6 H); 1.82−1.97 (m, 2 H); 4.27 (d, $J = 1.9$, 2 H); 5.07 (s, 2 H); 7.10−7.30 (m, 16 H); 7.33−7.37 (m, 4 H). $^{13}C$ NMR (75 MHz, $CDCl_3$): 15.6, 21.4, 29.1, 53.0, 66.9, 88.2, 125.5, 126.3, 127.6, 128.0, 128.2, 128.3, 139.0, 143.1, 157.4. FAB-MS: 575 (23, $[M + H]^+$), 530 (14, $[M - CO_2]^+$), 250 (100, $[M - CO_2 - C_{18}H_{18}NO_2$). Anal. Calcd for $C_{37}H_{38}N_2O_4$ (574.72): C, 77.33; H, 6.66; N, 4.87. Found: C, 77.33; H, 6.71; N, 4.94.

**(*S*)-4-Isopropyl-5,5-diphenyl-3-(phenylsulfanylmethyl)oxazolidin-2-one (4).** To a suspension of **1** (1.07 g, 3.80 mmol) in DME (8 mL) was added BuLi (2.89 mL, 4.18 mmol) at 0 °C. After the mixture was stirred for 10 min, NaI (627 mg, 4.18 mmol) and chloromethyl phenyl sulfide (542 $\mu$L, 4.18 mmol) were added consecutively to the reaction mixture. After being stirred for 12 h at room temperature, the reaction mixture was quenched with saturated aqueous $NH_4Cl$ solution and diluted with $Et_2O$. The organic layer was separated, and the aqueous layer was extracted with $Et_2O$ (2×). The combined organic layers were washed with $H_2O$ (1×), dried ($MgSO_4$), and concentrated under reduced pressure. The crude product was purified by FC (pentane/AcOEt 10:1) to afford **4** (807 mg, 53%) as a white solid. Mp: 137−141 °C. $[\alpha]^{rt}_D = +9.3$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3008, 1749, 1417, 1040, 1002 $cm^{-1}$. $^1H$ NMR (400 MHz, $CDCl_3$): $\delta$ 0.69 (d, $J = 6.8$, 3 H); 1.07 (d, $J = 7.4$, 3 H); 1.88−1.98 (m, 1 H); 4.38 (d, $J = 14.5$, 1 H); 4.80 (d, $J = 1.6$, 1 H); 5.41 (d, $J = 14.5$, 1 H); 6.92−6.95 (m, 2 H); 7.00−7.07 (m, 3 H); 7.16−7.30 (m, 6 H); 7.39−7.42 (m, 2 H); 7.46−7.50 (m, 2 H). $^{13}C$ NMR (100 MHz, $CDCl_3$): $\delta$ 15.5, 22.6, 29.7, 49.3, 65.6, 88.1, 125.4, 126.1, 127.0, 127.6, 128.0, 128.1, 128.4, 128.9, 130.4, 132.7, 138.9, 143.8, 156.2. FAB-MS: 294 (5, $[M - SPh]^+$), 250 (100, $[M - SPh - CO_2]^+$). Anal. Calcd for $C_{25}H_{25}NO_2S$ (403.54): C, 74.41; H, 6.24; N, 3.47; S, 7.95. Found: C, 74.24; H, 6.36; N, 3.52; S, 8.04.

**(*S*)-3-[(1*S*,2*S*)-2-Hydroxy-1-(methylsulfanyl)-2-phenylethyl]-4-isopropyl-5,5-diphenyloxazolidin-2-one (7b).** Compound **3** (430 mg, 1.26 mmol) was treated with BuLi (0.97 mL, 1.51 mmol) and benzaldehyde (166 $\mu$L, 1.64 mmol) according to GP 2. Purification of the crude product by FC (pentane/AcOEt 8:1) yielded **7b** (505 mg, 90%) as a 93:7 mixture with its C(2)-OH epimer. For analytical purposes, a sample was recrystallized twice (MeOH) to afford **7b** (dr 97:3) as a white solid. Mp: 200−201 °C. $[\alpha]^{rt}_D = -72.2$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3512, 3008, 1729, 1450, 1422, 1046 $cm^{-1}$. $^1H$ NMR (300 MHz, $CDCl_3$): $\delta$ 0.81 (d, $J = 6.5$, 3 H); 1.08 (d, $J = 7.5$, 3 H); 1.36 (s, 3 H); 2.00−2.07 (m, 1 H); 4.40 (d, $J = 9.3$, 1 H); 4.46 (d, $J = 5.6$, 1 H); 4.70 (d, $J = 2.2$, 1 H); 5.47 (dd, $J = 5.6$, 9.3, 1 H); 7.22−7.45 (m, 13 H); 7.72−7.75 (m, 2 H). $^{13}C$ NMR (75 MHz, $CDCl_3$): $\delta$ 10.5, 15.5, 21.9, 29.9, 68.4, 68.7, 74.0, 89.0, 125.2, 125.9, 127.0, 127.5, 128.1, 128.18, 128.21, 128.5, 138.4, 140.9, 143.8, 157.5. FAB-MS: 446 (2, $[M - H]^+$), 400 (47, $[M - SMe]^+$), 356 (100, $[M - SMe - CO_2]^+$). Anal. Calcd for $C_{27}H_{29}NO_3S$ (447.60): C, 72.45; H, 6.53; N, 3.13. Found: C, 72.15; H, 6.57; N, 3.32.

**(*S*)-3-[(1*S*,2*S*)-2-Hydroxy-2-phenyl-1-(phenylsulfanyl)-ethyl]-4-isopropyl-5,5-diphenyloxazolidin-2-one (7c).** Compound **3** (403 mg, 0.999 mmol) was treated with BuLi (0.82 mL, 1.20 mmol) and benzaldehyde (131 $\mu$L, 1.30 mmol) according to GP 2. Trituration of the crude product (boiling hexane, 2 × 10 mL) yielded **7c** (360 mg, 71%) as a 95:5 mixture with its C(2)-OH epimer and 5 mol % of inseparable unidentified side products. White solid. Mp: 200−203 °C. $[\alpha]^{rt}_D = -191.5$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3335, 3008, 1734, 1451, 1423, 1091 $cm^{-1}$. $^1H$ NMR (400 MHz, $CDCl_3$): $\delta$ 0.55 (d, $J = 6.8$, 3 H); 0.89 (d, $J = 7.3$, 3 H); 1.96−2.08 (m, 1 H); 4.37 (d, $J = 6.0$, 1 H); 4.51 (d, $J = 1.9$, 1 H); 4.81 (d, $J = 8.7$, 1 H); 5.36 (dd, $J = 6.0$, 8.7, 1 H); 6.78−6.81 (m, 2 H); 7.06−7.42 (m, 16 H); 7.53−7.59 (m, 2 H). $^{13}C$ NMR (100 MHz, $CDCl_3$): $\delta$ 15.2, 21.6, 29.8, 69.8, 74.0, 75.1, 88.8, 125.4, 126.3, 127.65, 127.71, 127.8, 128.0, 128.2, 128.4, 128.7, 128.9, 132.8, 133.8, 138.7, 140.5, 144.0, 157.3. FAB-MS: 492 (5, $[M + H - H_2O]^+$), 400 (52, $[M - SPh]^+$), 356 (100, $[M - SPh - CO_2]^+$).

**(*S*)-3-[(1*S*,2*S*)-2-Hydroxy-3-methyl-1-(methylsulfanyl)-but-3-enyl]-4-isopropyl-5,5-diphenyloxazolidin-2-one (9k).** Compound **3** (355 mg, 1.04 mmol) was treated with BuLi (0.83 mL, 1.25 mmol) and methacrolein (111 $\mu$L, 1.35 mmol) accord-

ing to GP 2. Purification of the crude product by FC (pentane/AcOEt 9:1) yielded **9k** (375 mg, 88%) as a 85:15 mixture with its C(2)-OH epimer. For analytical purposes, a sample was purified by FC (pentane/AcOEt 9:1) to afford **9k** (dr 98.5:1.5) as a white solid. Mp: 181−182 °C. $[\alpha]^{rt}_D = -99.6$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3508, 2967, 1730, 1450, 1423, 1003 $cm^{-1}$. $^1H$ NMR (300 MHz, $CDCl_3$): $\delta$ 0.85 (d, $J = 6.9$, 3 H); 1.10 (d, $J = 7.2$, 3 H); 1.38 (s, 3 H); 1.77 (s, 3 H); 2.00−2.14 (m, 1 H); 3.70 (d, $J = 4.7$, 1 H); 4.34 (d, $J = 10.0$, 1 H); 4.73 (d, $J = 2.2$, 1 H); 4.93−4.98 (m, 2 H); 5.06−5.08 (m, 1 H); 7.21−7.40 (m, 6 H); 7.45−7.49 (m, 2 H); 7.71−7.75 (m, 2 H). $^{13}C$ NMR (125 MHz, $CDCl_3$): $\delta$ 9.8, 15.9, 17.0, 22.0, 30.1, 65.2, 68.5, 74.2, 88.8, 115.3, 125.4, 126.0, 127.7, 128.2, 128.3, 128.6, 138.6, 143.5, 144.1, 157.3. FAB-MS: 412 (7, $[M + H]^+$), 364 (76, $[M - SMe]^+$), 320 (100, $[M - SMe - CO_2]^+$). Anal. Calcd for $C_{24}H_{29}NO_3S$ (411.56): C, 70.04; H, 7.10; N, 3.40. Found: C, 70.03; H, 6.97; N, 3.37.

**(*S*)-3-[(1*S*,2*S*)-2-Hydroxy-3-methyl-1-(methylsulfanyl)-butyl]-4-isopropyl-5,5-diphenyloxazolidin-2-one (9m) and (*S*)-3-[(1*S*,2*R*)-2-Hydroxy-3-methyl-1-(methylsulfanyl)butyl]-4-isopropyl-5,5-diphenyloxazolidin-2-one (10m).** Compound **3** (1.11 g, 3.25 mmol) was treated with BuLi (2.55 mL, 3.90 mmol) and isobutyraldehyde (384 $\mu$L, 4.23 mmol) according to GP 2. Trituration of the crude product (boiling hexane, 2 × 6 mL) yielded **9m** (1.13 g, 84%) as a 71:29 mixture with its C(2)-OH epimer **10m**. Alternatively, purification of the crude product by FC (pentane/$Et_2O$ 10:1) yielded **9m** (61%) and **10m** (21%) as single diastereoisomers. **9m**. White solid. Mp 217−218 °C. $[\alpha]^{rt}_D = -108.3$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3520, 2964, 1730, 1450, 1002 $cm^{-1}$. $^1H$ NMR (300 MHz, $CDCl_3$): $\delta$ 0.83 (d, $J = 6.9$, 6 H); 1.01 (d, $J = 6.9$, 3 H); 1.07 (d, $J = 7.5$, 3 H); 1.35 (s, 3 H); 2.00−2.21 (m, 2 H); 3.48 (s, 1 H); 4.23−4.31 (m, 2 H); 4.74 (d, $J = 2.2$, 1 H); 7.20−7.38 (m, 6 H); 7.47−7.49 (m, 2 H); 7.74−7.76 (m, 2 H). $^{13}C$ NMR (75 MHz, $CDCl_3$): $\delta$ 9.6, 14.1, 15.9, 20.7, 21.8, 29.1, 30.0, 65.4, 68.5, 73.2, 88.7, 125.3, 126.0, 127.5, 128.1, 128.5, 138.6, 144.1, 157.4. FAB-MS: 366 (7, $[M - SMe]^+$), 322 (100, $[M - SMe\text{-}CO_2]^+$). Anal. Calcd for $C_{24}H_{31}NO_3S$ (413.58): C, 69.70; H, 7.55; N, 3.39. Found: C, 69.77; H, 7.57; N, 3.43. **10m**. White solid. Mp: 204−205 °C. $[\alpha]^{rt}_D = -163.8$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3388, 3007, 1728, 1450, 1425, 908 $cm^{-1}$. $^1H$ NMR (300 MHz, $CDCl_3$): $\delta$ 0.76 (d, $J = 6.9$, 3 H); 0.89 (d, $J = 6.9$, 3 H); 1.00 (d, $J = 6.5$, 3 H); 1.08 (d, $J = 7.2$, 3 H); 1.58 (s, 3 H); 1.81−1.95 (m, 1 H); 2.05−2.18 (m, 1 H); 3.78−3.86 (m, 1 H); 4.40 (d, $J = 2.5$, 1 H); 4.60 (d, $J = 1.9$, 1 H); 4.72 (d, $J = 2.5$, 1 H); 7.22−7.39 (m, 6 H); 7.48−7.51 (m, 2 H); 7.69−7.72 (m, 2 H). $^{13}C$ NMR (75 MHz, $CDCl_3$): $\delta$ 13.1, 16.0, 18.4, 20.0, 21.6, 29.8, 31.3, 67.7, 71.2, 78.8, 89.0, 125.1, 126.0, 127.7, 128.2, 128.3, 128.7, 138.4, 144.2, 157.6. FAB-MS: 414 (8, $[M + H]^+$), 366 (67, $[M - SMe]^+$), 322 (100, $[M - SMe - CO_2]^+$). Anal. Calcd for $C_{24}H_{31}NO_3S$ (413.58): C, 69.70; H, 7.55; N, 3.39. Found: C, 69.66; H, 7.55; N, 3.46.

**(*S*)-3-[(1*S*,2*S*)-2-Hydroxy-1-(methylsulfanyl)-2-phenylpropyl]-4-isopropyl-5,5-diphenyloxazolidin-2-one (11a).** Compound **3** (605 mg, 1.77 mmol) was treated with BuLi (1.45 mL, 2.13 mmol) and a solution of acetophenone (269 $\mu$L, 2.30 mmol) in THF (1 mL) according to GP 2. The crude product was triturated (boiling hexane, 2 × 7 mL) and recrystallized (MeOH) to give **11a** (456 mg, 56%) as a single diastereoisomer. White solid. Mp: 204−206 °C. $[\alpha]^{rt}_D = -118.6$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3692, 3314, 2936, 1721, 1450, 1036 $cm^{-1}$. $^1H$ NMR (400 MHz, $CDCl_3$): $\delta$ 0.23 (d, $J = 7.1$, 3 H); 0.51 (d, $J = 7.3$, 3 H); 1.67 (s, 3 H); 1.73 (d, $J = 0.9$, 3 H); 1.80−1.92 (m, 1 H); 4.45 (s, 1 H); 4.61 (d, $J = 1.9$, 1 H); 6.55 (br s, 1 H); 7.13−7.34 (m, 11 H); 7.45−7.48 (m, 2 H); 7.58−7.61 (m, 2 H). $^{13}C$ NMR (100 MHz, $CDCl_3$): $\delta$ 13.0, 16.4, 18.3, 29.5, 31.2, 69.5, 71.6, 79.3, 89.1, 125.19, 125.22, 126.6, 127.2, 127.6, 127.8, 128.1, 128.2, 128.6, 138.1, 144.1, 145.5, 158.3. FAB-MS: 462 (14, $[M + H]^+$), 444 (19, $[M + H - H_2O]^+$), 414 (100, $[M - SMe]^+$), 370 (65, $[M - SMe - CO_2]^+$). Anal. Calcd for $C_{28}H_{31}NO_3S$ (461.62): C, 72.85; H, 6.77; N, 3.03. Found: C, 72.78; H, 6.86; N, 3.16.

**(*S*)-4-Isopropyl-5,5-diphenyl-3-((1*S*,2*R*)-3,3,3-trifluoro-2-hydroxy-1-methylsulfanyl-2-phenylpropyl)oxazolidin-2-one (11b).** Compound **3** (443 mg, 1.30 mmol) was treated with BuLi (1.10 mL, 1.68 mmol) and phenyl trifluoromethyl ketone (265 $\mu$L, 1.95 mmol) according to GP 2. The crude product was recrystallized (MeOH) to give **11b** (372 mg, 55%) as a single diastereoisomer. White solid. Mp: >240 °C. $[\alpha]^{rt}_D = -99.7$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3007, 1746, 1685, 1494, 1410, 1034 $cm^{-1}$. $^1H$ NMR (400 MHz, $CDCl_3$): $\delta$ 0.77 (d, $J = 7.0$, 3 H); 1.19 (d, $J = 7.4$, 3 H); 1.46 (s, 3 H); 2.19−2.26 (m, 1 H); 4.67 (s, 1 H); 4.81 (d, $J = 1.8$, 1 H); 7.25−7.43 (m, 12 H); 7.62−7.64 (m, 2 H); 8.24 (s, 1 H). $^{13}C$ NMR (100 MHz, $CDCl_3$): $\delta$ 14.3, 15.5, 20.7, 29.5, 68.5, 71.1, 80.8 (q, $J_{C,F} = 27.7$), 90.2, 125.5, 126.6, 128.0, 128.1, 128.3, 128.5, 128.62, 128.64, 137.4, 138.2, 143.7, 160.2. $^{19}F$ NMR (282 MHz, $CDCl_3$): −73.82 (s, 3 F). MALDI-MS: 538 (100, $[M + Na]^+$), 424 (60, $[M - SMe - CO_2]^+$), 249 (89). Anal. Calcd for $C_{28}H_{28}F_3NO_3S$ (515.60): C, 65.23; H, 5.47; N, 2.72; S, 6.22. Found: C, 65.15; H, 5.54; N, 2.67; S, 6.21.

**(*S*)-4-Isopropyl-3-[(1*S*,2*R*)-2-methyl-1-(methylsulfanyl)-4-oxo-2,4-diphenylbutyl]-5,5-diphenyloxazolidin-2-one (13).** Compound **3** (350 mg, 1.02 mmol) was treated with BuLi (0.79 mL, 1.23 mmol) and benzalacetophenone (277 mg, 1.33 mmol) according to GP 2. Purification of the crude product by FC ($CH_2Cl_2$/pentane 3:1 to $CH_2Cl_2$ + 1% $Et_2O$) yielded **13** (441 mg, 79%) as a 98:2 mixture with its C(2)-Ph epimer. For analytical purposes, a sample was recrystallized (MeOH) to afford **13** (dr ≥ 99:1) as a white solid. Mp: 224−226 °C. $[\alpha]^{rt}_D = -99.8$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3005, 1744, 1682, 1487, 1179, 1092 $cm^{-1}$. $^1H$ NMR (400 MHz, $CD_2Cl_2$): $\delta$ 0.24 (d, $J = 6.9$, 3 H); 0.83 (d, $J = 7.4$, 3 H); 1.72 (s, 3 H); 1.89−1.97 (m, 1 H); 3.25 (dd, $J = 7.8$, 17.1, 1 H); 3.86 (dd, $J = 4.8$, 17.1, 1 H); 4.49 (d, $J = 1.7$, 1 H); 4.72 (d, $J = 10.9$, 1 H); 4.80 (ddd, $J = 4.8$, 7.8, 10.9, 1 H); 7.04−7.54 (m, 18 H); 7.82−7.85 (m, 2 H). $^{13}C$ NMR (100 MHz, $CD_2Cl_2$): $\delta$ 13.1, 15.6, 20.6, 30.0, 42.2, 45.4, 68.9, 69.1, 87.8, 125.5, 126.9, 127.7, 127.8, 128.2, 128.3, 128.7, 128.8, 128.86, 128.90, 133.2, 137.8, 139.6, 142.1, 145.0, 157.1, 197.6. MALDI-MS: 572 (100, $[M + Na]^+$), 440 (38, $[M - SMe - CO_2 - H_2O]^+$). Anal. Calcd for $C_{35}H_{35}NO_3S$ (549.73): C, 76.47; H, 6.42; N, 2.56; S, 5.83. Found: C, 76.35; H, 6.47; N, 2.49; S, 5.85.

***N*-[(1*S*,2*S*)-2-((*S*)-4-Isopropyl-2-oxo-5,5-diphenyloxazolidin-3-yl)-2-methylsulfanyl-1-phenylethyl]diphenylphosphinamide (14a).** Compound **3** (257 mg, 0.753 mmol) was treated with BuLi (0.60 mL, 0.903 mmol) and a solution of *N*-diphenylphosphinoylimine (derived from benzaldehyde)[47] (299 mg, 0.978 mmol) in THF (1 mL) according to GP 2. Trituration of the crude product (boiling MeOH, 2 × 5 mL) yielded **14a** (214 mg, 44%) as a 97:3 mixture with its C(1)-NH epimer. For analytical purposes, a sample was recrystallized (MeOH) to afford **14a** (dr ≥ 99:1) as a white solid. Mp: >240 °C. $[\alpha]^{rt}_D = -86.5$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3319, 2986, 1736, 1451, 1438, 1124 $cm^{-1}$. $^1H$ NMR (400 MHz, $CDCl_3$): $\delta$ 0.33 (d, $J = 6.9$, 3 H); 0.87 (d, $J = 7.3$, 3 H); 1.67 (s, 3 H); 1.90−2.01 (m, 1 H); 4.61 (d, $J = 8.0$, 1 H); 4.79−4.87 (m, 2 H) (H,P-coupling); 5.33 (br s, 1 H); 7.08−7.48 (m, 19 H); 7.57−7.68 (m, 4 H); 7.75−7.85 (m, 2 H). $^{13}C$ NMR (100 MHz, $CDCl_3$): $\delta$ 14.6, 15.4, 20.6, 29.5, 58.8, 69.2 (d, $J_{C,P} = 6.9$), 69.4, 88.7, 125.4, 126.4, 127.6, 127.7, 127.89, 127.93, 128.0, 128.1, 128.25, 128.31, 128.4, 128.5, 131.18, 131.20, 131.56, 131.59, 131.8, 131.9, 132.0, 132.1, 132.3, 133.2, 133.6, 138.8, 140.2, 143.9, 157.8 (C,P-coupling). $^{31}P$ NMR (162 MHz, $CDCl_3$): 21.66. MALDI-MS: 669 (42, $[M + Na]^+$), 599 (39, $[M - SMe]^+$), 581 (12, $[M - SMe\text{-}H_2O]^+$), 555 (65, $[M - SMe - CO_2]^+$), 338 (100). Anal. Calcd for $C_{39}H_{39}N_2O_3PS$ (646.79): C, 72.42; H, 6.08; N, 4.33; S, 4.96. Found: C, 72.45; H, 6.22; N, 4.27; S, 5.14.

***N*-[(1*S*,2*S*)-2-((*S*)-4-Isopropyl-2-oxo-5,5-diphenyloxazolidin-3-yl)-2-methylsulfanyl-1-phenylethyl]-2,4,6-trimethylbenzenesulfonamide (14c).** Compound **3** (341 mg, 0.999 mmol) was treated with BuLi (0.80 mL, 1.20 mmol) and a solution of *N*-mesitylsulfonylimine (derived from benzaldehyde)[47] (374 mg, 1.30 mmol) in THF (1 mL) according to GP 2. Trituration of the crude product (boiling MeOH, 2 × 6 mL) yielded **14c** (390 mg, 62%) as a 95:5 mixture with its C(1)-NH epimer. For analytical purposes, a sample was recrystallized (MeOH) to afford **14c** (dr ≥ 99:1) as a white solid. Mp: >240 °C. $[\alpha]^{rt}_D = -69.4$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3270, 1736, 1451, 1328, 1157 $cm^{-1}$. $^1H$ NMR (400 MHz, $CDCl_3$): $\delta$ 0.21 (d, $J =$

6.9, 3 H); 0.73 (d, $J = 7.3$, 3 H); 1.69 (s, 3 H); 1.80−1.89 (m, 1 H); 2.14 (s, 3 H); 2.43 (s, 6 H); 4.52 (d, $J = 7.5$, 1 H); 4.67 (d, $J = 1.6$, 1 H); 5.03 (dd, $J = 7.5$, 8.5, 1 H); 6.62 (d, $J = 0.5$, 2 H); 6.95−7.06 (m, 5 H); 7.16−7.31 (m, 5 H); 7.35−7.41 (m, 4 H); 7.65−7.68 (m, 2 H). $^{13}$C NMR (100 MHz, $CDCl_3$): $\delta$ 14.4, 15.0, 20.4, 22.8, 29.5, 61.8, 67.3, 69.4, 89.0, 125.3, 126.2, 127.4, 127.6, 127.7, 127.9, 128.0, 128.3, 128.8, 131.4, 135.4, 136.9, 138.0, 138.5, 141.3, 143.7, 157.7. MALDI-MS: 651 (100, $[M + Na]^+$), 537 (6, $[M - SMe - CO_2]^+$). Anal. Calcd for $C_{36}H_{40}N_2O_4S_2$ (628.86): C, 68.76; H, 6.41; N, 4.45; S, 10.20. Found: C, 68.83; H, 6.32; N, 4.48; S, 10.19.

***N*-{(1*R*,2*S*)-2-[(*S*)-4-Isopropyl-2-oxo-5,5-diphenyloxazolidin-3-yl]-2-methylsulfanyl-1-isopropylethyl}-2,4,6-trimethylbenzenesulfonamide (15d).** Compound **3** (335 mg, 0.981 mmol) was treated with BuLi (0.79 mL, 1.18 mmol) and a solution of *N*-mesitylsulfonylimine (derived from isobutyraldehyde)[47] (323 mg, 1.28 mmol) in THF (1 mL) according to GP 2. Purification of the crude product by FC (pentane/$Et_2O$ 3:1) yielded **15d** (251 mg, 43%) as a 97:3 mixture with its C(1)-NH epimer and 5 mol % of inseparable unidentified side products. For analytical purposes, a sample was recrystallized (MeOH) to afford **15d** (dr ≥ 99:1) as a white solid. Mp:196−198 °C. $[\alpha]^{rt}_D = -120.2$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3370, 3009, 1745, 1408, 1336, 1158, 657 cm$^{-1}$. $^1$H NMR (400 MHz, $CDCl_3$): $\delta$ 0.29 (d, $J = 6.9$, 3 H); 0.48 (d, $J = 6.9$, 3 H); 0.78 (d, $J = 7.0$, 3 H); 1.12−1.21 (m, 1 H); 1.19 (d, $J = 7.3$, 3 H); 2.17 (s, 3 H); 2.29 (s, 3 H); 2.29−2.36 (m, 1 H); 2.68 (s, 6 H); 3.55−3.62 (m, 1 H); 4.85 (d, $J = 4.5$, 1 H); 4.92 (d, $J = 1.8$, 1 H); 4.96 (d, $J = 9.9$, 1 H); 6.94 (d, $J = 0.5$, 2 H); 7.20−7.38 (m, 6 H); 7.52−7.56 (m, 2 H); 7.75−7.78 (m, 2 H). $^{13}$C NMR (100 MHz, $CDCl_3$): $\delta$ 15.2, 16.9, 17.1, 17.7, 19.7, 20.9, 23.1, 29.7 30.9, 60.3, 64.3, 67.7, 89.2, 125.1, 126.4, 127.6, 128.06, 128.08, 128.7, 132.0, 136.5, 137.8, 138.3, 141.9, 144.8, 157.3. MALDI-MS: 617 (100, $[M + Na]^+$), 503 (46, $[M - SMe - CO_2]^+$). Anal. Calcd for $C_{33}H_{42}N_2O_4S_2$ (594.84): C, 66.63; H, 7.12; N, 4.71; S, 10.78. Found: C, 66.76; H, 7.11; N, 4.82; S, 10.74.

**(*S*)-4-Isopropyl-3-[(1*S*,2*S*)-2-(methoxymethoxy)-1-(methylsulfanyl)-2-phenyl-ethyl]-5,5-diphenyloxazolidin-2-one (16).** To a solution of compound **3** (500 mg, 1.46 mmol) in THF (8 mL) was added BuLi (1.20 mL, 1.76 mmol) at −78 °C. After being stirred for 15 min, the reaction mixture was cooled to −100 °C and benzaldehyde (192 $\mu$L, 1.90 mmol) was added dropwise. It was allowed to warm to −78 °C within 20 min, and then MOMCl (189 $\mu$L, 2.49 mmol) was added. After the mixture was stirred for 4 h at room temperature, the white precipitate that developed in the course of the reaction was dissolved in $CH_2Cl_2$ and the reaction was stopped by quenching with saturated aqueous $NH_4Cl$ solution. The organic layer was separated, and the aqueous layer was extracted with $CH_2Cl_2$ (2×). The combined organic layers were dried ($MgSO_4$) and concentrated under reduced pressure. The crude product was triturated (boiling hexane, 2 × 5 mL) and recrystallized ($MeOH/CH_2Cl_2$) to give **16** (557 mg, 77%) as a 98.5:1.5 mixture with its C(2)-OH epimer. White solid. Mp: 201−203 °C. $[\alpha]^{rt}_D = -60.6$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3008, 1750, 1419, 1101, 1022 cm$^{-1}$. $^1$H NMR (300 MHz, $CDCl_3$): $\delta$ 0.87 (d, $J = 6.9$, 3 H); 1.25 (d, $J = 7.2$, 3 H); 1.44 (s, 3 H); 2.13−2.23 (m, 1 H); 3.21 (s, 3 H); 4.43 (d, $J = 10.6$, 1 H); 4.48 (d, $J = 6.4$, 1 H); 4.63 (d, $J = 1.9$, 1 H); 4.70 (d, $J = 6.4$, 1 H); 5.60 (d, $J = 10.6$, 1 H); 7.21−7.36 (m, 11 H); 7.49−7.52 (m, 2 H); 7.69−7.72 (m, 2 H). $^{13}$C NMR (75 MHz, $CDCl_3$): $\delta$ 12.9, 15.1, 21.6, 30.1, 56.1, 67.9, 69.4, 78.1, 88.0, 95.6, 125.4, 126.2, 127.4, 127.9, 127.96, 127.99, 128.2, 128.3, 128.4, 139.2, 139.8, 144.6, 156.4. FAB-MS: 492 (7, $[M + H]^+$), 444 (100, $[M - SMe]^+$), 400 (36, $[M - SMe - CO_2]^+$). Anal. Calcd for $C_{29}H_{33}NO_4S$ (491.65): C, 70.85; H, 6.77; N, 2.85. Found: C, 70.63; H, 6.81; N, 2.85.

**(*S*)-3-[(1*S*,2*S*)-2-Benzyloxy-3-methyl-1-(methylsulfanyl)but-3-enyl]-4-isopropyl-5,5-diphenyloxazolidin-2-one (17).** To a solution of compound **3** (1.58 g, 4.62 mmol) in THF (20 mL) was added BuLi (3.77 mL, 5.55 mmol) at −78 °C. After being stirred for 15 min, the reaction mixture was cooled to −100 °C and methacrolein (493 $\mu$L, 6.01 mmol) was added dropwise. It was allowed to warm to −78 °C within 20 min, and then BnBr (933 $\mu$L, 7.85 mmol) and DMPU (2 mL) were added. After the mixture was stirred for 5 h at room temperature, the reaction was stopped by quenching with saturated aqueous $NH_4Cl$ solution. The organic layer was separated, and the aqueous layer was extracted with $CH_2Cl_2$ (2×). The combined organic layers were dried ($MgSO_4$) and concentrated under reduced pressure. The crude product was filtered through a silica plug (pentane/$Et_2O$ 5:1) and triturated (boiling hexane, 3 × 10 mL) to give **17** (1.27 g, 55%) as a single diastereoisomer. White solid. Mp: 193−195 °C. $[\alpha]^{rt}_D = -104.1$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3067, 1748, 1450, 1047, 912 cm$^{-1}$. $^1$H NMR (400 MHz, $CDCl_3$): $\delta$ 0.62 (d, $J = 6.8$, 3 H); 1.03 (d, $J = 7.3$, 3 H); 1.59 (s, 3 H); 1.68 (d, $J = 0.5$, 3 H); 2.01−2.13 (m, 1 H); 4.39−4.49 (m, 3 H); 4.56 (d, $J = 1.9$, 1 H); 5.05−5.06 (m, 1 H); 5.10 (d, $J = 10.0$, 1 H); 5.13 (s, 1 H); 7.17−7.33 (m, 11 H); 7.43−7.46 (m, 2 H); 7.67−7.70 (m, 2 H). $^{13}$C NMR (100 MHz, $CDCl_3$): $\delta$ 11.4, 15.2, 16.2, 21.2, 30.0, 63.4, 69.1, 71.2, 81.9, 87.7, 117.1, 125.4, 126.3, 127.2, 127.4, 127.95, 127.98, 128.1, 128.4, 138.5, 139.1, 141.3, 144.7, 156.5. FAB-MS: 502 (13, $[M + H]^+$), 454 (100, $[M - SMe]^+$), 410 (51, $[M - SMe - CO_2]^+$). Anal. Calcd for $C_{31}H_{35}NO_3S$ (501.69): C, 74.22; H, 7.03; N, 2.79. Found: C, 74.20; H, 7.16; N, 2.87.

**(*S*)-3-[(1*S*,2*S*)-2-(*tert*-Butyldimethylsilanyloxy)-3-methyl-1-(methylsulfanyl)butyl]-4-isopropyl-5,5-diphenyloxazolidin-2-one (18).** To a solution of compound **9m** (503 mg, 1.22 mmol) in $CH_2Cl_2$ (3 mL) were added *i*-$Pr_2NEt$ (563 $\mu$L, 3.29 mmol) and 3-(*tert*-butyldimethylsilanyloxy)triflate (560 $\mu$L, 2.44 mmol) at 0 °C. After being stirred for 10 min at 0 °C, the reaction mixture was quenched with MeOH (2 mL) and concentrated under reduced pressure. The crude product was purified by FC (pentane/$Et_2O$ 15:1 to 10:1) to yield **18** (560 mg, 87%) as a white foam. $[\alpha]^{rt}_D = -163.0$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 2964, 1741, 1408, 834 cm$^{-1}$. $^1$H NMR (300 MHz, $C_6D_6$, 50 °C): $\delta$ 0.16 (s, 3 H); 0.40 (s, 3 H); 0.61 (d, $J = 6.5$, 3 H); 0.72 (d, $J = 6.5$, 3 H); 0.81 (d, $J = 7.5$, 3 H); 1.02−1.08 (m, 1 H); 1.03 (d, $J = 6.9$, 3 H); 1.09 (s, 9 H); 2.12 (s, 3 H); 2.91−3.03 (m, 1 H); 3.92−3.99 (m, 1 H); 5.05 (d, $J = 3.7$, 1 H); 5.20 (d, $J = 3.1$, 1 H); 6.90−7.02 (m, 4 H); 7.06−7.11 (m, 2 H); 7.60−7.63 (m, 2 H); 7.75−7.78 (m, 2 H). $^{13}$C NMR (100 MHz, $CDCl_3$): $\delta$ −4.8, −2.3, 15.8, 16.7, 18.8, 19.3, 19.4, 19.8, 26.8, 29.4, 31.0, 64.3, 70.2, 83.4, 87.7, 125.3, 127.48, 127.52, 127.6, 127.9, 128.2, 138.1, 145.1, 157.5. FAB-MS: 528 (13, $[M + H]^+$), 480 (100, $[M - SMe]^+$), 436 (80, $[M - SMe - CO_2]^+$). Anal. Calcd for $C_{30}H_{45}NO_3SiS$ (527.84): C, 68.26; H, 8.59; N, 2.65. Found: C, 68.31; H, 8.50; N, 2.67.

**(*S*)-2-(Methoxymethoxy)-2-phenylethanol (21).** Compound **16** (450 mg, 0.915 mmol) was treated with $Hg(O_2CCF_3)_2$ (430 mg, 1.01 mmol) and $NaBH_4$ (26 mg, 0.686 mmol)/DBU (69 $\mu$L, 0.458 mmol) according to GP 3. The chiral auxiliary **1** was recoverd by filtration (184 mg, 71%). Purification of the crude product by FC (pentane/AcOEt 4:1) yielded **21** (151 mg, 90%). The enantiomeric purity of **21** was determined by GC to be ≥99:1. Colorless oil. $^1$H NMR (300 MHz, $CDCl_3$): 2.84 (dd, $J = 4.4$, 8.7, 1 H); 3.40 (s, 3 H); 3.63−3.79 (m, 2 H); 4.64 (d, $J = 6.7$, 1 H); 4.66 (d, $J = 6.7$, 1 H); 4.71 (dd, $J = 3.9$, 7.9, 1 H); 7.27−7.38 (m, 5 H). The physical data are in agreement with the values reported in the literature.[57]

**(*S*)-2-Benzyloxy-3-methylbut-3-en-1-ol (22).** Compound **17** (616 mg, 1.23 mmol) was treated with $Hg(O_2CCF_3)_2$ (576 mg, 1.35 mmol) and $NaBH_4$ (35 mg, 0.921 mmol)/DBU (92 $\mu$L, 0.614 mmol) according to GP 3. The chiral auxiliary **1** was recoverd by filtration (287 mg, 83%). Purification of the crude product by FC (pentane/AcOEt 6:1) yielded **22** (194 mg, 82%) as a colorless oil. $[\alpha]^{rt}_D = +71.3$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3587, 3008, 1454, 1394, 1102, 912 cm$^{-1}$. $^1$H NMR (400 MHz, $CDCl_3$): $\delta$ 1.71−1.72 (m, 3 H); 2.31 (br s, 1 H); 3.52−3.58 (m, 1 H); 3.60−3.65 (m, 1 H); 3.91 (dd, $J = 4.2$, 7.8, 1 H); 4.21 (d, $J = 11.6$, 1 H); 4.58 (d, $J = 11.6$, 1 H); 5.05−5.06 (m, 2 H); 7.23−7.36 (m, 5 H). $^{13}$C NMR (100 MHz, $CDCl_3$): $\delta$ 18.0, 64.4, 70.5, 83.7, 114.8, 127.7, 127.9, 128.4, 138.1, 141.8. EI-MS: 161 (9, $[M - CH_2OH]^+$), 91 (100, $Bn^+$). Anal. Calcd for $C_{12}H_{16}O_2$ (192.26): C, 74.97; H, 8.39. Found: C, 74.87; H, 8.27.

**(*S*)-2-(*tert*-Butyldimethylsilanyloxy)-3-methylbutan-1-ol (23).** Compound **18** (326 mg, 0.618 mmol) was treated with

(57) Ko, K. Y.; Eliel, E. L. *J. Org. Chem.* **1986**, *51*, 5353.

$Hg(O_2CCF_3)_2$ (290 mg, 0.680 mmol) and $NaBH_4$ (18 mg, 0.464 mmol)/DBU (46 $\mu$L, 0.309 mmol) according to GP 3. The chiral auxiliary **1** was recoverd by filtration (137 mg, 79%). Purification of the crude product by FC (pentane/AcOEt 13:1) yielded **23** (112 mg, 83%). The enantiomeric purity of **23** was determined by GC to be ≥99:1. Colorless oil. $^1$H NMR (300 MHz, $CDCl_3$): 0.05 (s, 6 H); 0.85−0.89 (m, 15 H); 1.74−1.87 (m, 2 H); 3.42−3.52 (m, 2 H). The physical data are in agreement with the values reported in the literature.[58]

***N*-((*S*)-2-Hydroxy-1-phenylethyl)-2,4,6-trimethylbenzenesulfonamide (24).** Compound **14c** (292 mg, 0.464 mmol) was treated with $Hg(O_2CCF_3)_2$ (218 mg, 0.511 mmol) and $NaBH_4$ (13 mg, 0.348 mmol)/DBU (35 $\mu$L, 0.232 mmol) according to GP 3. The chiral auxiliary **1** was recoverd by filtration (92 mg, 70%). Purification of the crude product by FC ($CH_2Cl_2$, 0.5% MeOH) yielded **24** (101 mg, 68%) as a white solid. $[\alpha]^{rt}_D = +68.4$ ($c = 1$, $CHCl_3$). $^1$H NMR (300 MHz, $CDCl_3$): 2.04 (t, $J = 6.1$, 1 H); 2.26 (s, 3 H); 2.51 (s, 6 H); 3.71−3.76 (m, 2 H); 4.31 (dd, $J = 5.8$, 11.5, 1 H); 5.36 (d, $J = 5.8$, 1 H); 6.84 (s, 2 H); 7.03−7.09 (m, 2 H); 7.15−7.23 (m, 3 H). The physical data are in agreement with the values reported in the literature.[59]

**(*S*)-2-Phenylpropane-1,2-diol (25).** Compound **11a** (370 mg, 0.802 mmol) was treated with $Hg(O_2CCF_3)_2$ (376 mg, 0.882 mmol) and $NaBH_4$ (23 mg, 0.601 mmol)/DBU (60 $\mu$L, 0.401 mmol) according to GP 3. The chiral auxiliary **1** was recoverd by filtration (192 mg, 85%). Purification of the crude product by FC (pentane/AcOEt 2:1) yielded **25** (101 mg, 82%). The enantiomeric purity of **25** was determined by GC to be ≥99:1. Colorless oil. $^1$H NMR (300 MHz, $CDCl_3$): 1.52 (s, 3 H); 2.21 (br s, 1 H); 2.83 (br s, 1 H); 3.60 (d, $J = 11.1$, 1 H); 3.77 (d, $J = 11.1$, 1 H), 7.24−7.46 (m, 5 H). The physical data are in agreement with the values reported in the literature.[60]

**(2*R*,3*S*)-3-(*tert*-Butyldimethylsilanyloxy)-4-methylpentan-2-ol (28).** Compound **18** (615 mg, 1.17 mmol) was treated with $Hg(O_2CCF_3)_2$ (547 mg, 1.28 mmol) and MeMgCl (4.66 mL, 4.66 mmol) according to GP 4. The chiral auxiliary **1** was recoverd by filtration (300 mg, 91%). Purification of the crude product by FC (pentane/$Et_2O$ 15:1) yielded **28** (207 mg, 76%) as a 83:17 mixture with its C(2)-OH epimer. For analytical purposes, a sample was purified by FC (pentane/$Et_2O$ 15:1) to afford **28** as a single diastereoisomer. The enantiomeric purity of **28** and its C(2)-OH epimer were both determined by GC to be ≥99:1. Colorless oil. $[\alpha]^{rt}_D = -11.6$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3599, 2958, 1472, 1113, 1049, 858 cm$^{-1}$.$^1$H NMR (400 MHz, $CDCl_3$): $\delta$ 0.09 (s, 3 H); 0.10 (s, 3 H); 0.89 (d, $J = 6.9$, 3 H); 0.93 (s, 9 H); 0.94 (d, $J = 6.9$, 3 H); 1.15 (d, $J = 6.4$, 3 H); 1.74−1.83 (m, 1 H); 1.86 (d, $J = 5.1$, 1 H); 3.38 (dd, $J = 3.7$, 5.0, 1 H); 3.79−3.87 (m, 1 H). $^{13}$C NMR (100 MHz, $CDCl_3$): $\delta$ −4.3, −3.9, 17.7, 18.3, 18.4, 20.4, 26.1, 30.1, 69.8, 80.5. EI-MS: 187 (44, [M − MeCHOH]$^+$), 159 (100). Anal. Calcd for $C_{12}H_{28}O_2Si$ (232.44): C, 62.01; H, 12.14. Found: C, 62.11; H, 11.95.

**(1*R*,2*S*)-2-(*tert*-Butyldimethylsilanyloxy)-3-methyl-1-phenylbutan-1-ol (29) and (1*S*,2*S*)-2-(*tert*-Butyldimethylsilanyloxy)-3-methyl-1-phenylbutan-1-ol (29 minor).** Compound **18** (555 mg, 1.05 mmol) was treated with $Hg(O_2CCF_3)_2$ (493 mg, 1.16 mmol) and PhLi (2.63 mL, 4.20 mmol) according to GP 4. The chiral auxiliary **1** was recoverd by filtration (258 mg, 87%). Purification of the crude product by FC (pentane/$Et_2O$ 30:1 to 25:1) yielded **29** (194 mg, 63%) and **29** minor (50 mg, 16%) as single diastereoisomers. The enantiomeric purity of **29** was determined by GC to be ≥99:1. **29**. Colorless oil. $[\alpha]^{rt}_D = -21.6$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3606, 2958, 2930, 1472, 1043, 836 cm$^{-1}$.$^1$H NMR (400 MHz, $CDCl_3$): $\delta$ −0.11 (s, 3 H); 0.08 (s, 3 H); 0.80 (d, $J = 6.8$, 3 H); 0.91 (s, 9 H); 0.94 (d, $J = 6.8$, 3 H); 1.66−1.74 (m, 1 H); 2.43 (br s, 1 H); 3.72 (dd, $J = 3.1$, 5.2, 1 H); 4.75 (d, $J = 5.2$, 1 H); 7.23−7.39 (m, 5 H). $^{13}$C NMR (100 MHz, $CDCl_3$): $\delta$ −4.6, −4.4, 17.0, 18.3, 21.1, 26.0, 29.3, 76.7, 80.1, 126.7, 127.4, 128.2, 141.4. EI-MS: 277 (14, [M + H − $H_2O$]$^+$), 187 (100, [M − PhCHOH]$^+$). Anal. Calcd for $C_{17}H_{30}O_2Si$ (294.51): C, 69.33; H, 10.27. Found: C, 69.22; H, 10.34. The enantiomeric purity of **29** minor was determined by GC to be ≥99:1. **29** minor. Colorless oil. $[\alpha]^{rt}_D = +49.6$ ($c = 1$, $CHCl_3$). $^1$H NMR (300 MHz, $CDCl_3$): $\delta$ −0.27 (s, 3 H); 0.00 (s, 3 H); 0.90 (s, 9 H); 0.95 (d, $J = 6.9$, 3 H); 1.00 (d, $J = 6.9$, 3 H); 1.74−1.83 (m, 1 H); 2.96 (d, $J = 6.2$, 1 H); 3.63 (t, $J = 4.0$, 1 H); 4.67 (dd, $J = 4.0$, 6.2, 1 H); 7.24−7.37 (m, 5 H). $^{13}$C NMR (100 MHz, $CDCl_3$): $\delta$ −4.9, −4.3, 17.7, 18.3, 19.1, 26.0, 31.8, 73.0, 81.6, 126.2, 127.1, 128.1, 143.3.

**(*S*)-4-Isopropyl-3-((*S*)-methoxymethoxyphenylacetyl)-5,5-diphenyloxazolidin-2-one (30).** Compound **16** (557 mg, 1.13 mmol) was treated with $Hg(O_2CCF_3)_2$ (532 mg, 1.25 mmol) and PCC (512 mg, 2.37 mmol) according to GP 5. Purification of the crude product by FC (pentane/AcOEt 7:1) yielded **30** (382 mg, 73%) as a white solid. Mp: 130−134 °C. $[\alpha]^{rt}_D = -52.5$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3008, 1782, 1710, 1371, 1151, 1043 cm$^{-1}$. $^1$H NMR (300 MHz, $CDCl_3$): $\delta$ 0.83 (d, $J = 6.9$, 3 H); 0.95 (d, $J = 6.8$, 3 H); 1.95−2.06 (m, 1 H); 3.38 (s, 3 H); 4.72 (d, $J = 6.9$, 1 H); 4.75 (d, $J = 6.9$, 1 H); 5.25 (d, $J = 3.7$, 1 H); 6.33 (s, 1 H); 6.98−7.37 (m, 15 H). $^{13}$C NMR (75 MHz, $CDCl_3$): $\delta$ 16.5, 21.6, 29.6, 56.0, 65.7, 76.1, 89.8, 95.9, 125.0, 125.7, 127.8, 127.9, 128.2, 128.3, 128.4, 128.6, 134.8, 137.7, 141.9, 152.6, 170.5. FAB-MS: 460 (13, [M + H]$^+$), 444 (37), 398 (100, [M − $OCH_2OCH_3$]$^+$). Anal. Calcd for $C_{28}H_{29}NO_5$ (459.54): C, 73.18; H, 6.36; N, 3.05. Found: C, 73.14; H, 6.36; N, 3.11.

**(*S*)-3-((*S*)-2-Benzyloxy-3-methylbut-3-enoyl)-4-isopropyl-5,5-diphenyloxazolidin-2-one (31).** Compound **17** (512 mg, 1.02 mmol) was treated with $Hg(O_2CCF_3)_2$ (479 mg, 1.12 mmol) and PCC (462 mg, 2.14 mmol) according to GP 5. Purification of the crude product by FC (pentane/AcOEt 13:1) yielded **31** (362 mg, 76%) with 13 mol % of a inseparable compound (later identified as compound (*S*)-3-formyl-4-isopropyl-5,5-diphenyloxazolidin-2-one). This mixture was used for further transformations. For analytical purposes, a sample was recrystallized three times ($CH_2Cl_2$/hexane) to afford pure **31** as a white solid. Mp: 107−108 °C. $[\alpha]^{rt}_D = -83.7$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3063, 1783, 1710, 1450, 1178, 1094 cm$^{-1}$. $^1$H NMR (400 MHz, $CDCl_3$): $\delta$ 0.78 (d, $J = 6.8$, 3 H); 0.91 (d, $J = 7.0$, 3 H); 1.47 (dd, $J = 0.9$, 1.3, 3 H); 1.98−2.07 (m, 1 H); 4.45−4.46 (m, 1 H); 4.49 (d, $J = 11.5$, 1 H); 4.54−4.55 (m, 1 H); 4.56 (d, $J = 11.5$, 1 H); 5.31 (d, $J = 3.6$, 1 H); 5.50 (d, $J = 0.4$, 1 H); 7.24−7.38 (m, 11 H); 7.40−7.42 (m, 2 H); 7.46−7.49 (m, 2 H). $^{13}$C NMR (100 MHz, $CDCl_3$): $\delta$ 16.5, 18.7, 21.8, 29.7, 65.9, 71.6, 80.3, 89.8, 116.3, 125.3, 125.7, 127.8, 128.0, 128.1, 128.4, 128.46, 128.52, 128.8, 137.6, 137.8, 139.7, 142.6, 152.8, 170.1. FAB-MS: 470 (100, [M + H]$^+$), 426 (14, [M + H − $CO_2$]$^+$), 362 (52, [M − OBn]$^+$). Anal. Calcd for $C_{30}H_{31}NO_4$ (469.58): C, 76.73; H, 6.65; N, 2.98. Found: C, 76.67; H, 6.65; N, 3.01.

**(*S*)-Methoxymethoxyphenylacetic Acid Methyl Ester (32).** Compound **30** (358 mg, 0.779 mmol) was treated with DBU (233 $\mu$L, 1.56 mmol) and LiBr (338 mg, 3.90 mmol) according to GP 6. The chiral auxiliary **1** was recoverd by filtration (186 mg, 85%). Purification of the crude product by FC (pentane/AcOEt 7:1) yielded **32** (135 mg, 83%). The enantiomeric purity of **32** was determined by HPLC to be ≥99:1. Colorless oil. $^1$H NMR (300 MHz, $CDCl_3$): $\delta$ 3.37 (s, 3 H); 3.69 (s, 3 H); 4.67 (d, $J = 6.9$, 1 H); 4.74 (d, $J = 6.9$, 1 H); 5.17 (s, 1 H); 7.32−7.38 (m, 3 H); 7.42−7.46 (m, 2 H). The physical data are in agreement with the values reported in the literature.[61]

**(*S*)-2-Benzyloxy-3-methylbut-3-enoic Acid Methyl Ester (33).** Compound **31** (362 mg, 0.770 mmol, 13 mol % of (*S*)-3-formyl-4-isopropyl-5,5-diphenyloxazolidin-2-one) was treated with DBU (230 $\mu$L, 1.54 mmol) and LiBr (334 mg, 3.85 mmol) according to GP 6. The chiral auxiliary **1** was recoverd by filtration (203 mg, 71% overall yield from **17**). Purification of the crude product by FC (pentane/AcOEt 16:1) yielded **33** (141 mg, 63% overall yield from **17**). Colorless oil. $[\alpha]^{rt}_D = +55.0$

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($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3008, 1746, 1454, 1177, 1096, 913 $cm^{-1}$. $^1H$ NMR (300 MHz, $CDCl_3$): $\delta$ 1.78−1.79 (m, 3 H); 3.75 (s, 3 H); 4.38 (s, 1 H); 4.52 (d, $J = 12.0$, 1 H); 4.58 (d, $J = 12.0$, 1 H); 5.11−5.14 (m, 2 H); 7.26−7.37 (m, 5 H). $^{13}C$ NMR (75 MHz, $CDCl_3$): $\delta$ 17.9, 52.1, 70.6, 81.4, 116.4, 127.8, 127.9, 128.3, 137.1, 139.9, 170.8. EI-MS: 181 (4), 161 (32, $[M - CO_2Me]^+$), 114 (33, $[M + H - OBn]^+$), 91 (100, $Bn^+$). Anal. Calcd for $C_{13}H_{16}O_3$ (220.27): C, 70.89; H, 7.32. Found: C, 70.84; H, 7.46.

**(*E*)-(*R*)-4-Hydroxy-4-phenylpent-2-enoic Acid Methyl Ester (34) and (*R*)-5-Methyl-5-phenyl-5*H*-furan-2-one (35).** Compound **11a** (750 mg, 1.63 mmol) was treated with $Hg(O_2CCF_3)_2$ (762 mg, 1.79 mmol) and DBU (122 $\mu$L, 0.812 mmol)/ylide (1.09 g, 3.25 mmol) according to GP 7. The chiral auxiliary **1** was recoverd (365 mg, 80%). Purification of the crude product by FC ($CH_2Cl_2$/pentane 3:1) yielded **34** (208 mg, 62%) and **35** (75 mg, 27%) as single stereoisomers. **34**. Colorless oil. $[\alpha]^{rt}_D = +20.3$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3595, 3009, 1718, 1436, 1281, 1174 $cm^{-1}$.$^1H$ NMR (300 MHz, $CDCl_3$): $\delta$ 1.71 (s, 3 H); 2.23 (s, 1 H); 3.73 (s, 1 H); 6.12 (d, $J = 15.8$, 1 H); 7.17 (d, $J = 15.8$, 1 H); 7.24−7.38 (m, 3 H); 7.42−7.48 (m, 2 H). $^{13}C$ NMR (75 MHz, $CDCl_3$): $\delta$ 28.9, 51.7, 74.2, 118.0, 125.1, 127.6, 128.5, 144.6, 153.4, 167.2. EI-MS: 205 (1, $[M - H]^+$), 188 (21, $[M - H_2O]^+$), 131 (100). Anal. Calcd for $C_{12}H_{14}O_3$ (206.24): C, 69.89; H, 6.84. Found: C, 69.62; H, 6.91. **35**. Colorless oil. $[\alpha]^{rt}_D = +275.6$ ($c = 1$, $CHCl_3$). $^1H$ NMR (300 MHz, $CDCl_3$): 1.82 (s, 3 H); 6.04 (d, $J = 5.6$, 1 H); 7.28−7.40 (m, 5 H); 7.64 (d, $J = 5.6$, 1 H).$^{13}C$ NMR (75 MHz, $CDCl_3$): 26.2, 88.8, 119.2, 124.7, 128.3, 128.8, 139.2, 160.4, 172.3.

**(*S*)-3-((2*S*,3*R*)-3,5-Diphenyl-2,3-dihydrofuran-2-yl)-4-isopropyl-5,5-diphenyloxazolidin-2-one (36).** To a solution of ketone **13** (400 mg, 0.728 mmol) in THF (5 mL) was added $Hg(O_2CCF_3)_2$ (341 mg, 0.801 mmol) at room temperature. After the mixture was stirred for 20 min, $H_2O$ was added, and the reaction mixture was diluted with $Et_2O$. The organic layer was separated, and the aqueous layer was extracted with $Et_2O$ (2×). The combined organic layers were dried ($MgSO_4$) and concentrated under reduced pressure. Purification of the crude product by FC (pentane/$Et_2O$ 4:1, 1% $Et_3N$) and trituration (boiling hexane, 10 mL) afforded **36** as a single diastereoisomer. Due to purification problems only small amounts of product could be isolated. White solid. Mp: 211−213 °C. $[\alpha]^{rt}_D = +54.0$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3022, 1754, 1490, 1374, 1010, 947 $cm^{-1}$. $^1H$ NMR (400 MHz, $CDCl_3$): 0.81 (d, $J = 6.7$, 3 H); 0.91 (d, $J = 7.3$, 3 H); 1.91−2.02 (m, 1 H); 4.32 (dd, $J = 2.7$, 7.3, 1 H); 4.68 (d, $J = 1.5$, 1 H); 5.47 (d, $J = 2.7$, 1 H); 5.98 (d, $J = 7.3$, 1 H); 6.76−6.78 (m, 2 H); 7.10−7.16 (m, 2 H); 7.24−7.27 (m, 1 H); 7.30−7.40 (m, 10 H); 7.53−7.55 (m, 3 H); 7.67−7.69 (m, 2 H). $^{13}C$ NMR (100 MHz, $CDCl_3$): 15.6, 20.6, 29.5, 51.8, 68.6, 89.0, 94.1, 98.3, 125.2, 125.3, 126.0, 127.2, 127.4, 127.7, 128.2, 128.3, 128.7, 128.86, 128.88, 129.9, 130.5, 141.3, 144.4, 155.2, 156.5. MALDI-MS: 524 (100, $[M + Na]^+$), 458 (29), 248 (21). MALDI-HRMS: *m/z* 524.2196 [$C_{34}H_{31}NO_3$ $(M + Na)^+$ requires 524.2196].

**Isopropyl-3-((1*S*,2*S*,3*R*,5*R*)-5-methoxy-3,5-diphenyltetrahydrofuran-2-yl)-5,5-diphenyloxazolidin-2-one (37).** Compound **36** (30 mg, 0.060 mmol) was dissolved in MeOH (3 mL) at room temperature. Colorless crystals were formed upon standing for 3 days. The crystals were isolated and identified as compound **37** (single diastereoisomer). White solid. Mp: 182−184 °C. $[\alpha]^{rt}_D = -28.4$ ($c = 0.5$, $CHCl_3$). IR ($CHCl_3$): 3008, 1759, 1449, 1129, 998 $cm^{-1}$. $^1H$ NMR (400 MHz, $CDCl_3$): $\delta$ 0.68 (d, $J = 6.7$, 3 H); 0.82 (d, $J = 7.3$, 3 H); 1.90−1.97 (m, 1 H); 2.56 (dd, $J = 6.3$, 13.5, 1 H); 2.66 (dd, $J = 11.4$, 13.5, 1 H); 3.11 (s, 3 H); 4.03−4.08 (m, 1 H); 4.56 (d, $J = 1.6$, 1 H); 5.52 (d, $J = 8.3$, 1 H); 7.16−7.36 (m, 16 H); 7.45−7.48 (m, 2 H); 7.53−7.56 (m, 2 H). $^{13}C$ NMR (100 MHz, $CDCl_3$): $\delta$ 14.9, 20.7, 29.7, 45.0, 47.4, 49.4, 68.0, 88.5, 92.4, 106.5, 125.5, 126.0, 126.2, 126.9, 127.6, 127.9, 128.0, 128.12, 128.14, 128.4, 128.6, 138.9, 140.0, 140.2, 144.0, 156.6. MALDI-MS: 556 (70, $[M + Na]^+$), 524 (47, $[M + Na - OMe]^+$), 458 (100, $[M - OMe - CO_2]^+$). MALDI-HRMS: *m/z* 556.2438 [$C_{35}H_{35}NO_4$ $(M + Na)^+$ requires 556.2458].

**(*S*)-4-Isopropyl-3-(1-methylsulfanylethyl)-5,5-diphenyloxazolidin-2-one (38).** To a solution of compound **3** (210 mg, 0.615 mmol) in THF (3 mL) was added BuLi (0.48 mL) at −78 °C. After the solution was stirred for 10 min, MeI (50 $\mu$L, 0.800 mmol) was added dropwise. After being stirred for 15 min, the reaction was stopped by quenching with saturated aqueous $NH_4Cl$ solution. The reaction mixture was diluted with $Et_2O$, the organic layer was separated, and the aqueous layer was extracted with $CH_2Cl_2$ (2×). The combined organic layers were dried ($MgSO_4$) and concentrated under reduced pressure. Trituration of the crude product (boiling hexane, 4 mL) yielded **38** (192 mg, 88%) as a 83:17 mixture with its C(1)-SMe epimer. For analytical purposes, a sample was recrystallized twice ($Et_2O$) to afford **38** (dr 95:5) as a white solid. Mp: 166−167 °C. $[\alpha]^{rt}_D = -138.2$ ($c = 1$, $CHCl_3$, dr 83:17). IR ($CHCl_3$): 3008, 1739, 1493, 1450, 1178, 1002 $cm^{-1}$. $^1H$ NMR (400 MHz, $CDCl_3$): $\delta$ 0.71 (d, $J = 7.0$, 3 H); 1.03 (d, $J = 7.3$, 3 H); 1.32 (s, 3 H); 1.52 (d, $J = 7.3$, 3 H); 1.97−2.08 (m, 1 H); 4.74 (d, $J = 1.9$, 1 H); 4.94 (*q*, $J = 7.3$, 1 H); 7.21−7.37 (m, 6 H); 7.50−7.53 (m, 2 H); 7.69−7.72 (m, 2 H). $^{13}C$ NMR (100 MHz, $CDCl_3$): $\delta$ 14.0, 16.6, 19.4, 22.4, 30.0, 59.0, 67.2, 89.1, 125.3, 126.5, 127.6, 128.1, 128.2, 128.6, 138.7, 144.8, 157.0. MALDI-MS: 378 (6, $[M + Na]^+$), 264 (54, $[M - SMe - CO_2]^+$), 167 (100). Anal. Calcd for $C_{21}H_{25}NO_2S$ (355.50): C, 70.95; H, 7.09; N, 3.94. Found: C, 70.99; H, 7.25; N, 3.95.

**(*S*)-4-*tert*-Butyl-3-(methylsulfanylmethyl)-5,5-diphenyloxazolidin-2-one (39).** (*S*)-4-*tert*-Butyl-5,5-diphenyloxazolidin-2-one[62] (1.52 g, 5.15 mmol) was treated with BuLi (3.65 mL, 5.66 mmol) and MTMCl (520 $\mu$L, 6.18 mmol) according to GP 1. Purification of the crude product by filtering through a silica plug ($CH_2Cl_2$) and subsequent trituration (boiling hexane, 10 mL) yielded **39** (1.03 g, 56%) as a white solid. Mp: 196−197 °C. $[\alpha]^{rt}_D = -134.3$ ($c = 1.03$, $CHCl_3$). IR ($CHCl_3$): 3007, 2964, 1744, 1450, 1405, 1086, 882 $cm^{-1}$. $^1H$ NMR (400 MHz, $CDCl_3$): $\delta$ 0.86 (s, 9 H); 1.08 (s, 3 H); 4.21 (d, $J = 14.7$, 1 H); 4.55 (s, 1 H); 4.94 (d, $J = 14.7$, 1 H); 7.18−7.30 (m, 4 H); 7.34−7.39 (m, 2 H); 7.54 (br s, 2 H); 7.74−7.77 (m, 2 H). $^{13}C$ NMR (100 MHz, $CDCl_3$): $\delta$ 13.0, 28.1, 37.3, 50.9, 69.1, 89.6, 125.5, 127.6, 127.7, 128.2, 128.6, 138.1, 145.1, 157.7. MALDI-MS: 378 (8, $[M + Na]^+$), 264 (2, $[M - SMe - CO_2]^+$), 208 (100, $[M - SMe - CO_2 -$ isobutene$]^+$). Anal. Calcd for $C_{21}H_{25}NO_2S$ (355.50): C, 70.95; H, 7.09; N, 3.94, S: 9.02. Found: C, 70.82; H, 7.15; N, 3.93, S: 8.94.

**(*R*)-3-(Methylsulfanylmethyl)-4,5,5-triphenyloxazolidin-2-one (40).** (*R*)-4-Phenyl-5,5-diphenyloxazolidin-2-one[35b] (1.81 g, 5.74 mmol) was treated with BuLi (4.07 mL, 6.31 mmol) and MTMCl (580 $\mu$L, 6.89 mmol) according to GP 1. Purification of the crude product by FC (pentane/$Et_2O$ 4:1) and subsequent trituration (boiling hexane, 10 mL) yielded **40** (1.62 g, 75%) as a white solid. Mp: 129−131 °C. $[\alpha]^{rt}_D = +39.8$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3008, 1749, 1450, 1410, 1080, 882 $cm^{-1}$. $^1H$ NMR (400 MHz, $CDCl_3$): $\delta$ 1.79 (s, 3 H); 3.60 (d, $J = 14.2$, 1 H); 4.91 (d, $J = 14.2$, 1 H); 5.79 (s, 1 H); 6.97−7.07 (m, 7 H); 7.12−7.15 (m, 3 H); 7.32−7.37 (m, 1 H); 7.40−7.45 (m, 2 H); 7.73−7.76 (m, 2 H). $^{13}C$ NMR (100 MHz, $CDCl_3$): $\delta$ 13.7, 46.7, 66.6, 88.4, 126.1, 126.5, 127.3, 127.6, 128.48, 128.51, 128.6, 128.7, 134.4, 138.9, 142.1, 156.8. MALDI-MS: 398 (3, $[M + Na]^+$), 284 (100, $[M - SMe - CO_2]^+$), 206 (22). Anal. Calcd for $C_{23}H_{21}NO_2S$ (355.50): C, 73.57; H, 5.64; N, 3.73, S: 8.54. Found: C, 73.40; H, 5.76; N, 3.78, S: 8.48.

**(4*S*,5*R*)-4-Isopropyl-3-(methylsulfanylmethyl)-5-phenyloxazolidin-2-one (41).** (4*S*,5*R*)-4-Isopropyl-5-phenyloxazolidin-2-one[63] (798 mg, 3.89 mmol) was treated with BuLi (3.17 mL, 4.67 mmol) and MTMCl (424 $\mu$L, 5.06 mmol) according to GP 1. Purification of the crude product by FC (pentane/AcOEt 8:1) yielded **41** (915 mg, 89%) as a white solid. Mp: 91−93 °C. $[\alpha]^{rt}_D = +27.9$ ($c = 1$, $CHCl_3$). IR ($CHCl_3$): 3008, 2924, 1748, 1454, 1418, 997 $cm^{-1}$. $^1H$ NMR (300 MHz, $CDCl_3$): $\delta$ 0.70 (d, $J = 6.9$, 3 H); 0.84 (d, $J = 7.2$, 3 H); 1.61−1.78 (m, 1 H); 2.20

(62) We are grateful to Novartis Pharma AG for donation of 4-*tert*-butyl-5,5-diphenyloxazolidin-2-one (preparation in analogy to ref 35b).

(63) Preparation in analogy to: (a) Fujita, M.; Hiyama, T. *J. Org Chem.* **1988**, *53*, 5415. (b) Kano, S.; Yokomatsu, T.; Iwasawa, H.; Shibuya, S. *Chem. Pharm. Bull.* **1988**, *36*, 3341.

(s, 3 H); 4.10 (d, $J$ = 14.2, 1 H); 4.21 (dd, $J$ = 2.6, 8.1, 1 H); 5.06 (d, $J$ = 14.2, 1 H); 5.66 (d, $J$ = 8.1, 1 H); 7.31−7.42 (m, 5 H). $^{13}$C NMR (75 MHz, $CDCl_3$): $\delta$ 14.4, 16.4, 21.0, 28.2, 48.5, 61.6, 79.9, 126.1, 128.3, 128.4, 134.6, 158.2. FAB-MS: 531 (50, $[2M + H]^+$), 266 (13, $[M + H]^+$), 218 (100, $[M - SMe]^+$), 174 (84, $[M - SMe - CO_2]^+$). Anal. Calcd for $C_{14}H_{19}NO_2S$ (265.38): C, 63.36; H, 7.22; N, 5.28. Found: C, 63.41; H, 7.36; N, 5.25.

**(*S*)-3-[2-Hydroxy-1-methyl-1-(methylsulfanyl)-2-phenylethyl]-4-isopropyl-5,5-diphenyloxazolidin-2-one (42) and 3-[(*S*)-1-(Hydroxydiphenylmethyl)-2-methylpropyl]-4-methyl-4-(methylsulfanyl)-5-phenyl-oxazolidin-2-one (43).** Compound **38** (368 mg, 1.04 mmol, dr 83:17) was treated with BuLi (0.82 mL, 1.24 mmol) and benzaldehyde (136 $\mu$L, 1.35 mmol) according to GP 2. Compounds **42** and **43** were obtained as a 60:40 mixture, determined by $^1$H NMR of the crude product. Purification of the crude product by FC (pentane/$Et_2O$ 6:1 to 3:1) yielded **42** (201 mg, 42%) as a 61:17:14:8 mixture of diastereoisomers and **43** (yield not determined) as a 55:45 mixture of diastereoisomers. For analytical purposes, a sample of **42** was recrystallized twice (MeOH) to afford **42** as a single diastereoisomer. **42**. White solid. Mp: 182−183 °C. $[\alpha]^{rt}_D$ = −83.6 ($c$ = 1, $CHCl_3$). IR ($CHCl_3$): 3063, 3008, 1721, 1451, 1387, 1023 cm$^{-1}$. $^1$H NMR (300 MHz, $CDCl_3$): $\delta$ 0.71 (d, $J$ = 7.5, 3 H); 0.82 (d, $J$ = 7.2, 3 H); 1.25 (s, 3 H); 1.51 (s, 3 H); 1.89−2.03 (m, 1 H); 4.63 (d, $J$ = 2.2, 1 H); 4.68 (d, $J$ = 6.5, 1 H); 5.54 (d, $J$ = 6.5, 1 H); 7.18−7.39 (m, 9 H); 7.42−7.53 (m, 4 H); 7.71−7.76 (m, 2 H). $^{13}$C NMR (75 MHz, $CDCl_3$): $\delta$ 11.0, 17.5, 18.9, 22.1, 31.7, 68.1, 72.7, 75.7, 88.7, 125.5, 126.6, 127.4, 127.6, 127.7, 127.9, 128.2, 128.5, 128.6, 138.6, 139.2, 144.5, 157.5. MALDI-MS: 370 (100, $[M - SMe - CO_2]^+$), 352 (19, $[M - H_2O - SMe - CO_2]^+$), 310 (54). Anal. Calcd for $C_{28}H_{31}NO_3S$ (461.62): C, 72.85; H, 6.77; N, 3.03. Found: C, 72.96; H, 6.65; N, 3.10. **43** major. White solid. $^1$H NMR (400 MHz, $CDCl_3$): $\delta$ 0.91 (d, $J$ = 7.3, 3 H); 1.07 (d, $J$ = 7.1, 3 H); 1.19 (s, 3 H); 1.54 (s, 3 H); 2.48−258 (m, 1 H); 4.54 (d, $J$ = 1.6, 1 H); 5.15 (s, 1 H); 7.08−7.40 (m, 11 H); 7.74−7.76 (m, 2 H); 7.79−7.81 (m, 2 H). $^{13}$C NMR (100 MHz, $CDCl_3$): $\delta$ 11.7, 19.7, 24.6, 24.8, 30.0, 65.9, 75.1, 82.3, 85.3, 125.9, 126.3, 126.6, 126.7, 127.2, 127.6, 128.1, 128.5, 129.1, 134.1, 144.9, 146.1, 158.8. MALDI-TOF-MS: 484 (100, $[M + Na]^+$), 400 (25).

**(*S*)-4-*tert*-Butyl-3-[(1*S*,2*S*)-2-hydroxy-1-(methylsulfanyl)-2-phenylethyl]-5,5-diphenyloxazolidin-2-one (44).** Compound **39** (235 mg, 0.661 mmol) was treated with BuLi (0.52 mL, 0.793 mmol) and benzaldehyde (87 $\mu$L, 0.859 mmol) according to GP 2. Trituration of the crude product (boiling hexane, 2 × 5 mL) yielded **44** (279 mg, 91%) as a 90:10 mixture with its C(2)-OH epimer. For analytical purposes, a sample was recrystallized (MeOH) to afford **44** (dr 91:9) as a white solid. Mp: 239−247 °C. $[\alpha]^{rt}_D$ = −142.8 ($c$ = 1.33, $CHCl_3$). IR ($CHCl_3$): 3512, 3008, 1729, 1450, 1416, 1048 cm$^{-1}$. $^1$H NMR (400 MHz, $CDCl_3$): $\delta$ 0.98 (s, 9 H); 1.15 (s, 3 H); 4.26 (d, $J$ = 5.0, 1 H); 4.39 (s, 1 H); 4.46 (d, $J$ = 9.9, 1 H); 5.52 (dd, $J$ = 5.0, 9.9, 1 H); 7.20−7.38 (m, 11 H); 7.53 (br s, 2 H); 7.75−7.78 (m, 2 H). $^{13}$C NMR (100 MHz, $CDCl_3$): $\delta$ 9.4, 28.2, 37.6, 69.6, 72.5, 73.6, 90.1, 125.8, 127.3, 127.7, 127.8, 128.1, 128.26, 128.31, 128.4, 138.2, 141.1, 144.8, 158.3. MALDI-MS: 484 (13, $[M + Na]^+$), 370 (6, $[M - SMe - CO_2]^+$), 314 (42, $[M - SMe - CO_2 -$ isobutene$]^+$), 296 (100). Anal. Calcd for $C_{28}H_{31}NO_3S$ (461.62): C, 72.85; H, 6.77; N, 3.03. Found: C, 72.92; H, 6.95; N, 3.16.

**(*R*)-3-[(1*R*,2*R*)-2-Hydroxy-1-(methylsulfanyl)-2-phenylethyl]-4,5,5-triphenyloxazolidin-2-one (45).** Compound **40** (218 mg, 0.580 mmol) was treated with BuLi (0.45 mL, 0.697 mmol) and benzaldehyde (76 $\mu$L, 0.754 mmol) according to GP 2. Trituration of the crude product (boiling hexane, 2 × 5 mL) yielded **45** (253 mg, 91%) as a 79:21 mixture with its C(2)-OH epimer. For analytical purposes, a sample was recrystallized (MeOH) to afford **45** (dr 90:10) as a white solid. Mp: 207−213 °C. $[\alpha]^{rt}_D$ = +12.3 ($c$ = 1, $CHCl_3$). IR ($CHCl_3$): 3378, 3008, 1732, 1450, 1403, 1003, 866 cm$^{-1}$. $^1$H NMR (400 MHz, $CDCl_3$): $\delta$ 1.83 (s, 3 H); 4.10 (d, $J$ = 7.3, 1 H); 4.70 (d, $J$ = 7.0, 1 H); 5.25 (dd, $J$ = 7.0, 7.3, 1 H); 5.83 (s, 1 H); 6.87−6.93 (m, 2 H); 6.97−7.05 (m, 5 H); 7.12−7.27 (m, 7 H); 7.32−7.44 (m, 4 H); 7.65−7.68 (m, 2 H). $^{13}$C NMR (100 MHz, $CDCl_3$): $\delta$ 13.7, 66.9, 69.9, 75.1, 89.0, 125.9, 126.55, 126.61, 127.4, 127.5, 127.9, 128.2, 128.5, 128.69, 128.71, 133.8, 138.6, 140.5, 142.7, 157.8. MALDI-MS: 504 (22, $[M + Na]^+$), 390 (88, $[M - SMe\text{-}CO_2]^+$), 372 (100, $[M - H_2O - SMe - CO_2]^+$). Anal. Calcd for $C_{30}H_{27}NO_3S$ (481.61): C, 74.82; H, 5.65; N, 2.91. Found: C, 74.78; H, 5.53; N, 3.01.

**(4*S*,5*R*)-3-[(1*S*,2*S*)-2-Hydroxy-1-(methylsulfanyl)-2-phenylethyl]-4-isopropyl-5-phenyloxazolidin-2-one (46).** Compound **41** (260 mg, 0.980 mmol) was treated with BuLi (0.80 mL, 1.18 mmol) and benzaldehyde (129 $\mu$L, 1.27 mmol) according to GP 2. Purification of the crude product by FC (pentane/AcOEt 5:1) yielded **46** (313 mg, 86%) as a 88:12 mixture with its C(2)-OH epimer. For analytical purposes, a sample was recrystallized (MeOH) to afford **46** (dr 98.5:1.5) as a white solid. Mp: 160−163 °C. $[\alpha]^{rt}_D$ = +19.6 ($c$ = 1, $CHCl_3$). IR ($CHCl_3$): 3365, 3008, 1735, 1454, 1413, 1041 cm$^{-1}$. $^1$H NMR (400 MHz, $CDCl_3$): $\delta$ 0.69 (d, $J$ = 7.0, 3 H); 0.83 (d, $J$ = 7.2, 3 H); 1.78−1.89 (m, 1 H); 2.12 (s, 3 H); 4.06 (d, $J$ = 5.7, 1 H); 4.17 (dd, $J$ = 2.7, 7.7, 1 H); 4.75 (d, $J$ = 8.2, 1 H); 5.35 (dd, $J$ = 5.7, 8.2, 1 H); 5.53 (d, $J$ = 7.7, 1 H); 7.29−7.41 (m, 8 H); 7.48−7.50 (m, 2 H). $^{13}$C NMR (100 MHz, $CDCl_3$): $\delta$ 14.6, 16.9, 19.7, 28.8, 64.8, 69.0, 74.7, 81.1, 126.2, 126.9, 128.3, 128.5, 128.6, 134.3, 140.7, 159.0. FAB-MS: 372 (5, $[M + H]^+$), 354 (15, $[M + H - H_2O]^+$), 324 (100, $[M - SMe]^+$), 280 (65, $[M - SMe - CO_2]^+$). Anal. Calcd for $C_{21}H_{25}NO_3S$ (371.50): C, 67.90; H, 6.78; N, 3.77. Found: C, 67.96; H, 6.68; N, 3.85.

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**Supporting Information Available:** Full experimental data of compounds **5**, **9a**−**j**,**l**,**n**, **11c**−**k**, **14b**, **26**, and **27** and detailed $^1$H and $^{13}$C NMR spectra with signal assignments; further IR, MS, HPLC, GC, and optical rotation data of all compounds. This material is available free of charge via the Internet at http://pubs.acs.org.

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