DOI: 10.1002/ejoc.200500860

Asymmetric Synthesis of 3-Substituted γ- and δ-Sultams

Dieter Enders,*[a] Alexander Moll,[a] and Jan W. Bats[b]

Keywords: Asymmetric synthesis / Aminosulfonates / Cyclisation / Sulfonamides / Sultams

An efficient and flexible asymmetric synthesis of various 3-substituted γ- and δ-sultams is described. The key step is a diastereoselective nucleophilic 1,2-addition of various organocerium compounds to the CN double bond of ω-SAMP-hydrazonosulfonates. The resulting hydrazines were obtained in good to excellent diastereomeric excesses (*de* = 78 to ≥ 96 %). Removal of the chiral auxiliary by reductive N,N-bond cleavage afforded the corresponding aminosulfonates without racemisation. Ester hydrolysis and subsequent treatment of the resulting sulfonic acids with phosgene in toluene led to the aminosulfonyl chlorides, which were cyclised to the title compounds in good to excellent overall yields (39–51 %) and high enantiomeric excesses (*ee* = 78–99 %). The absolute configuration was determined by X-ray structure analysis and is in accordance with the postulated mechanism for the diastereoselective 1,2-addition.

Introduction

Compounds containing the sulfonamide function are well-known for their wide range of biological activities and especially their cyclic forms, the sultams, are of enormous importance as pharmaceuticals[1] and agricultural agents.[2] In Figure 1 three typical drugs are shown bearing the sultam moiety.[3]

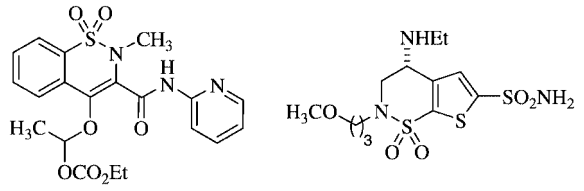


Figure 1. Selected sultams with various biological activities.

In addition to their application as pharmaceuticals, sultams have also been used as chiral auxiliaries[4] and reagents[5] with great success. Especially the well-known Oppolzer–Sultam,[6] easily be prepared from camphor, was utilised in numerous asymmetric reactions.[7] Despite the importance of these heterocycles in medicinal and synthetic chemistry, the number of methods for the synthesis of diastereo- and enantiomerically pure γ- and δ-sultams is still limited. Among the various approaches to the title compounds are radical cyclisations,[8] intramolecular alkylations or sultam formation,[9] intramolecular aziridinations of unsaturated sulfonamides and rhodium-catalysed amidation,[10] 1,3-dipolar cycloadditions[11] and intramolecular Heck reactions.[12] Lee et al.[13] and Cooper,[14] for instance, were able to synthesise chiral γ-sultams by intramolecular carbanion alkylation starting from the chiral β-amino alcohols. Furthermore, sultams can be synthesised by intra- or intermolecular Diels–Alder reactions[15] and ring-closing metathesis.[1a,16] In 1999, Hanson et al. described the first synthesis of cyclic sulfonamides with metathesis reactions,[17] and a few years later they reported on the successful enantioselective synthesis of γ-sultams.[18] Moreover, Metz et al. described the synthesis of bicyclic δ-sultams by intramolecular Diels–Alder reactions of vinylsulfonamides.[19]

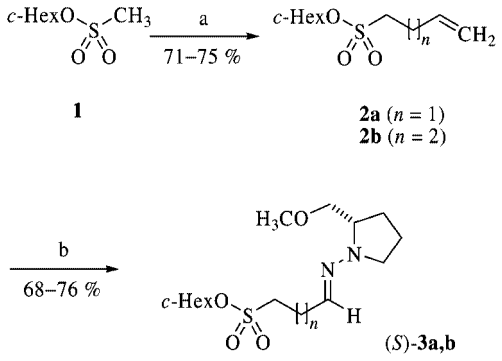
As part of our continuous interest in the asymmetric synthesis of sulfur-containing heterocycles,[20] we already described the diastereo- and enantioselective synthesis of *cis*-3,4-disubstituted β-sultams.[21] In this paper, we wish to report the efficient enantioselective synthesis of 3-substituted γ- and δ-sultams with the SAMP/RAMP-hydrazone methodology.[22]

Results and Discussion

As shown in Scheme 1, the desired γ- and δ-hydrazonosulfonates (*S*)-**3** could be synthesised on a multigram scale following a two-step protocol. The methanesulfonate **1** was

[a] Institut für Organische Chemie, RWTH Aachen,
Landoltweg 1, 52074 Aachen, Germany
Fax: +49-241-8092127
E-mail: enders@rwth-aachen.de
[b] Institut für Organische Chemie, Johann Wolfgang Goethe Universität Frankfurt,
Marie-Curie-Strasse 11, 60439 Frankfurt am Main, Germany

deprotonated with *n*-butyllithium at low temperature and trapped with allylbromide or 4-bromopent-1-ene to afford the unsaturated substrates **2**, which were obtained in good yields after flash column chromatography (**2a**, *n* = 1, 71%; **2b**, *n* = 2, 75%). The alkylation was initially tried using bromoacetaldehyde diethyl acetal as electrophile, but the desired aldehyde precursor could not be obtained in this way.

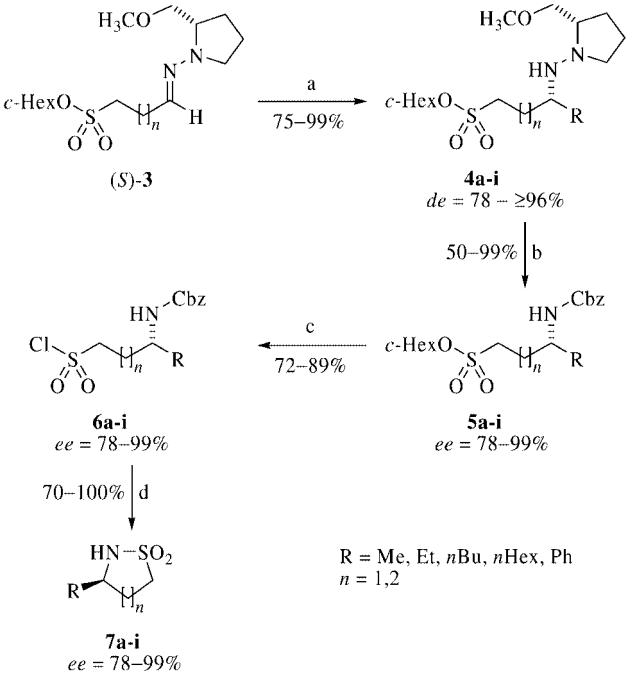


Scheme 1. Synthesis of γ- and δ-hydrazonosulfonates (*S*)-**3**. Reagents and conditions: a) 1. *n*BuLi, –78 °C, THF, 30 min; 2. RBr, 18 h, –78 °C to room temp.; b) 1. O_3, CH_2Cl_2, –78 °C; 2. PPh_3, 1 h; 3. CH_2Cl_2, 0 °C, SAMP, $MgSO_4$, room temp., 18 h.

Subsequent ozonolysis of the unsaturated sulfonates **2** and treatment with PPh_3 led to the corresponding aldehydes, which were directly condensed with the chiral auxiliary (SAMP) to the ω-hydrazonosulfonates (*S*)-**3** in good yields by the standard procedure (**3a**, *n* = 1, 68%; **3b**, *n* = 2, 76%).[23] With these compounds in hands, we were able to synthesise the title sultams following the well-established protocol for the nucleophilic 1,2-addition to aldehyde SAMP/RAMP-hydrazones with subsequent N–N bond cleavage, followed by ring closure as depicted in Scheme 2.

For the nucleophilic 1,2-addition to the CN double bond, organocerium reagents were used. Initial attempts utilizing commercially available organolithium or Grignard compounds turned out to be difficult in obtaining the desired hydrazines. Because of their high basicity, mainly elimination of the sulfur substituent was observed. Because of the lower basicity and the higher nucleophilicity of the Imamoto reagents, however, this problem could be simply circumvented.[24] The cerium reagents were freshly prepared from the corresponding organolithium or Grignard compounds and dehydrated $CeCl_3$ in a transmetallation reaction. First trials using the standard conditions[21a] led to poor yields and diastereoselectivities. Shorter reaction times (3 h) and hydrolysis at low temperature (–78 °C) were essential for a good asymmetric induction. By the use of these optimised conditions we were able to obtain the hydrazines **4** after aqueous work up and purification by flash column chromatography in good to excellent yields (77–99%) and with high diastereomeric excesses (78 to ≥ 96%). The results of the 1,2-additions are summarised in Table 1.

Obviously, the diastereoselectivities are dependent on the applied hydrazones and nucleophiles. In general, γ-hydrazonosulfonates led to lower diastereomeric excesses than their



Scheme 2. Asymmetric synthesis of γ- and δ-sultams **7**. Reagents and conditions: a) RM/$CeCl_3$, THF, –100 °C to –78 °C, 3 h; b) 1. BH_3·THF, THF, reflux, 4 h; 2. CbzCl, K_2CO_3, CH_2Cl_2, reflux, 18 h; c) 1. EtOH/H_2O, reflux, 18 h; 2. NaOAc, CH_2Cl_2, room temp., 1 h; 3. $COCl_2$ in toluene, CH_2Cl_2/DMF, room temp., 2 h; d) 1. HBr/AcOH, CH_2Cl_2, room temp., 3 h; 2. NEt_3, 0 °C, 2 h.

Table 1. Diastereoselective 1,2-addition of organocerium reagents to ω-hydrazonosulfonates (*S*)-**3** to afford the ω-hydrazinosulfonates **4**.

Product	R	*n*	Yield [%]	*de*[a] [%]
(*R*,*S*)-**4a**	Me	1	92	82
(*R*,*S*)-**4b**	Et	1	98	78
(*R*,*S*)-**4c**	*n*Bu	1	89	87
(*R*,*S*)-**4d**	*n*Hex	1	78	90
(*S*,*S*)-**4e**	Ph	1	99	≥ 96
(*R*,*S*)-**4f**	Me	2	78	≥ 96
(*R*,*S*)-**4g**	*n*Bu	2	94	≥ 96
(*R*,*S*)-**4h**	*n*Hex	2	75	≥ 96
(*S*,*S*)-**4i**	Ph	2	77	≥ 96

[a] Determined by ^{13}C NMR spectroscopy.

higher homologues. We assume that the sulfonate moiety and the chiral auxiliary can both be chelating ligands of the nucleophile. The disturbing influence of the sulfonate moiety decreases with growing distance to the hydrazone functionality, therefore the 1,2-addition to δ-hydrazonosulfonates proceeds with better diastereoselectivities. To explain the fact that at least two equivalents of the nucleophile are necessary to obtain good asymmetric induction, we assume a precoordination of the first equivalent of the organocerium reagent. As shown in Figure 2, the hydrazone substrates can act as bidentate (pyrrolidino nitrogen and methoxy group) and even tridentate (plus sulfonate group) ligands leading to the steric hindrance of the *si*-face. The second organocerium equivalent would then attack the *re*-face of the CN double bond as observed.

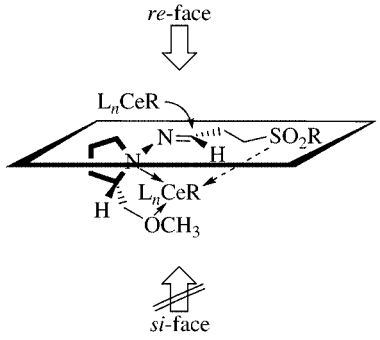


Figure 2. Proposed transition state for the asymmetric 1,2-addition.

Many procedures providing amines from their corresponding hydrazines by cleavage of the N,N bond have been reported.[25] Based on previous experiences[26] we decided to use the reductive cleavage by the BH_3·THF complex which is a very mild method which not requires the activation of the N,N bond. For that purpose the hydrazines **4** were dissolved in THF and heated to reflux with a large excess of the BH_3·THF complex. After methanolysis the corresponding amines were directly protected as benzyl carbamates. The ω-aminosulfonates **5** were obtained in good to very good yields (50–99%) and *ee* values of 78–99% (Table 2).

Table 2. Hydrazine cleavage with the BH_3·THF complex and subsequent protection of the amino function to afford the ω-aminosulfonates **5**.

Product	R	*n*	Yield [%]	*ee* [%]
(*R*)-**5a**	Me	1	50	84[a]
(*R*)-**5b**	Et	1	71	78[a]
(*R*)-**5c**	*n*Bu	1	99	87[b]
(*R*)-**5d**	*n*Hex	1	79	90[b]
(*S*)-**5e**	Ph	1	96	93[c]
(*R*)-**5f**	Me	2	58	≥ 96[b]
(*R*)-**5g**	*n*Bu	2	53	93[a]
(*R*)-**5h**	*n*Hex	2	70	93[c]
(*S*)-**5i**	Ph	2	98	99[c]

[a] Determined by HPLC on a chiral stationary phase. [b] In correlation with the *de* value of the corresponding hydrazine. [c] In correlation with the *ee* value of the resulting sultams.

The N,N-bond cleavage and the protection of the amino group was assumed to be free of racemisation in accordance to earlier results.[25s,25t,27] This was indeed a valid assumption that could be proven in several cases. Thus, the enantiomeric excesses determined by HPLC analysis using a chiral stationary phase are in correlation with the diastereomeric excesses of the corresponding hydrazinosulfonates **4** within the limits of detection. The other *ee* values given are based on the *ee* values of the resulting sultams **7**.

In the following step the aminosulfonates **5** were converted into their corresponding sulfonyl chlorides **6**. Based on our previous results[20d] we synthesised the free sulfonic acid by heating the sulfonate in a mixture of ethanol/water for 18 h. Without further purification the crude acids were transferred to their sodium salt, followed by chlorination with phosgene in toluene. Other chlorinating agents like thionyl chloride, phosphorus pentachloride or sulfuryl chloride were also tested but resulted in significantly lower yields. After aqueous work up and purification by flash column chromatography the Cbz-protected aminosulfonyl chlorides **6** were obtained in good yields (72–89%) and high enantiomeric excesses (78–99%) based on the *ee* values of the corresponding aminosulfonates **5** and sultams **7** (Table 3).

Table 3. Conversion of the aminosulfonates **5** to the corresponding sulfonyl chlorides **6**.

Product	*n*	R	Yield [%]	*ee* [%]
(*R*)-**6a**	1	Me	72	84[a]
(*R*)-**6b**	1	Et	74	78[c]
(*R*)-**6c**	1	*n*Bu	75	87[b]
(*R*)-**6d**	1	*n*Hex	83	90[b]
(*S*)-**6e**	1	Ph	80	93[c]
(*R*)-**6f**	2	Me	84	≥ 96[b]
(*R*)-**6g**	2	*n*Bu	89	93[c]
(*R*)-**6h**	2	*n*Hex	77	93[c]
(*S*)-**6i**	2	Ph	72	99[c]

[a] In correlation with the *ee* value of the corresponding ω-aminosulfonate. [b] In correlation with the *de* value of the corresponding hydrazines. [c] In correlation with the *ee* value of the resulting sultams.

Finally the Cbz-protected aminosulfonyl chlorides **6** were deprotected with HBr/AcOH and the resulting free amines were cyclised in situ with an excess of triethylamine. The corresponding 3-substituted sultams **7** were obtained in good to excellent yields (70–100%) and high enantiomeric excesses (78–99%, Table 4). The enantiomeric excesses were

Table 4. Cyclisation of ω-aminosulfonyl chlorides **6** to 3-substituted γ- and δ-sultams **7**.

Product	*n*	R	Yield [%]	*ee* [%][a]
(*R*)-**7b**	1	Et	70	78
(*R*)-**7c**	1	*n*Bu	99	87[b]
(*R*)-**7d**	1	*n*Hex	93	90[b]
(*S*)-**7e**	1	Ph	77	93
(*R*)-**7f**	2	Me	82	≥ 96[b]
(*R*)-**7g**	2	*n*Bu	100	93
(*R*)-**7h**	2	*n*Hex	100	93
(*S*)-**7i**	2	Ph	72	99

[a] Determined by GC on chiral stationary phase (Chirasil-dex). [b] In correlation with the *de* value of the corresponding hydrazines.

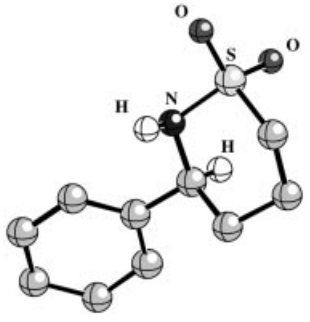


Figure 3. Crystal structure of the δ-sultam (*S*)-**7i**. H atoms at C(4) and N are represented as small spheres all other H atoms have been omitted for clarity.

determined by GC on chiral stationary phase by comparison with racemic samples.

The absolute configuration of the δ-sultam (*S*)-**7i** was determined by X-ray crystallography as depicted in Figure 3. The observed absolute configuration is in full agreement with the postulated transition state and our previous results on nucleophilic 1,2-additions of organolithium-, Grignard- and organocerium reagents to aldehyde-SAMP-hydrazones.[28]

Conclusion

In summary, we have developed an efficient asymmetric synthesis of 3-substituted γ- and δ-sultams through the asymmetric 1,2-addition to the CN double bond of ω-SAMP-hydrazonosulfonates. Subsequent cleavage of the chiral auxiliary and Cbz protection led to the corresponding ω-aminosulfonates. After ester hydrolysis and chlorination of the resulting ω-aminosulfonic acids the desired ω-aminosulfonyl chlorides were obtained in good yields. Deprotection of the amino group and cyclisation under basic conditions provided the substituted sultams in good overall yields (39–51%) and good to excellent enantiomeric excesses (*ee* = 78–99%).

Experimental Section

General Remarks: All reagents were purchased from common commercial suppliers and used from freshly opened containers. Solvents for chromatography and for work-up were dried and purified by conventional methods prior to use. Tetrahydrofuran was freshly distilled from sodium/lead and benzophenone under argon. *n*BuLi (1.6 N in hexane) was purchased from Merck, Darmstadt. Preparative flash column chromatography was carried out with Merck silica gel 60, particle size 0.040–0.063 mm. Optical rotation values were measured with a Perkin–Elmer P 241 polarimeter, solvents used were of Merck UVASOL quality. IR spectra: Perkin–Elmer FT/IR 1750 and Perkin–Elmer FT/IR 1720 X. NMR spectra: Varian VXR 300, Varian Gemini 300 and Varian Inova 400, TMS as internal standard. MS: Varian MAT 212 (EI, 70 eV, 1 mA) and Finnigan MAT SSQ 7000 (CI, 100 eV). Microanalyses were obtained with Heraeus, CHN-O-Rapid. High-resolution MS Finnigan MAT, MAT 95. Merck TLC plates silica gel 60 F_{254} have been used for TLC analyses and the products were visualized by UV detection or phosphomolybdic acid (5 wt.-% in EtOH).

General Procedure for the Synthesis of Sulfonates 2 (GP 1): Cyclohexyl methanesulfonate (1.0 equiv.) was dissolved in abs. THF (3 mL/mmol) under argon and cooled to –78 °C. *n*BuLi (1.0 equiv.) was added dropwise, and the solution was stirred at this temperature for 30 min. The electrophile was then added to the resulting red solution and the reaction mixture was warmed to room temperature overnight. After hydrolysis with pH 7 buffer solution (8 mL/mmol) the mixture was extracted three times with CH_2Cl_2. The combined organic phases were dried with $MgSO_4$ and concentrated in vacuo. The pure product was obtained after flash column chromatography (SiO_2, pentane/EtO_2, 6:1).

Cyclohexyl But-3-ene-1-sulfonate (2a): Cyclohexyl methanesulfonate (**1**, 5.35 g, 30 mmol) was deprotonated with *n*BuLi (14.4 mL, 36 mmol, 1.2 equiv.) and treated with allyl bromide (4.35 g, 36 mmol, 1.2 equiv.) as described in GP 1. Compound **2a** was obtained as a brown oil after purification by flash column chromatography (SiO_2, *n*-pentane/Et_2O, 6:1). Yield: 4.72 g (71%); R_f = 0.36 (*n*-pentane/Et_2O, 6:1). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 1.25–1.84 [m, 10 H, $(CH_2)_{cyclo}$], 2.60 (m, 2 H, SCH_2CH_2), 3.15 (m, 2 H, SCH_2), 4.71 (m, 1 H, OC*H*), 5.14 (m, 2 H, CH=CH_2), 5.84 (m, 1 H, C*H*=CH_2) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 23.5, 24.8, 32.7 [$(CH_2)_{cyclo}$], 27.8 (SCH_2CH_2), 50.7 (SCH_2), 81.0 (O*C*H), 117.1 (CH=CH_2), 133.7 (*C*H=CH_2) ppm. IR (film): $\tilde{\nu}$ = 3080 (w), 2939 (vs), 2862 (s), 1643 (w), 1451 (m), 1416 (w), 1355 (vs), 1244 (w), 1168 (vs), 1118 (w), 1091 (w), 1032 (w), 1000 (m), 934 (vs), 868 (s), 831 (m), 722 (w), 641 (w), 587 (w), 529 (w), 488 (w), 457 (w) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 136 (12), 94 (5), 84 (7), 83 (100), 82 (90), 81 (12), 79 (5), 67 (49). $C_{10}H_{18}O_3S$ (218.31): calcd. C 55.02, H 8.31; found C 55.44, H 8.55.

Cyclohexyl Pent-4-ene-1-sulfonate (2b): Cyclohexyl methanesulfonate (**1**, 3.57 g, 20 mmol) was deprotonated with *n*BuLi (8.0 mL, 24 mmol, 1.2 equiv.) and treated with 4-bromo-1-butene (3.24 g, 24 mmol, 1.2 equiv.) as described in GP 1. Compound **2b** was obtained as a brown oil after purification by flash column chromatography (SiO_2, *n*-pentane/Et_2O, 6:1). Yield: 3.49 g (75%); R_f = 0.50 (*n*-pentane/Et_2O, 6:1). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 1.24–1.97 [m, 12 H, $(CH_2)_{cyclo}$, $SO_2CH_2CH_2$], 2.21 (m, 2 H, CH_2=CHC*H*$_2$), 3.07 (t, 2 H, *J* = 7.7 Hz, SO_2CH_2), 4.70 (m, 1 H, OC*H*), 5.08 (m, 2 H, C*H*$_2$=CH), 5.77 (m, 1 H, CH_2=C*H*) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 22.7 ($SO_2CH_2CH_2$), 23.5, 24.9, 32.8 [$(CH_2)_{cyclo}$], 31.9 (CH_2=CH*C*H$_2$), 50.6 (SO_2CH_2), 80.8 (O*C*H), 116.4 (*C*H$_2$=CH), 136.1 (CH_2=*C*H) ppm. IR (film): $\tilde{\nu}$ = 3078 (w), 2940 (vs), 2862 (s), 1641 (m), 1452 (m), 1346 (vs), 1267 (w), 1168 (vs), 1118 (w), 1032 (w), 1000 (m), 935 (vs), 869 (vs), 829 (m), 732 (m), 641 (w), 582 (m), 531 (m), 488 (w) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 232 (0.4) [M$^+$], 151 (9), 133 (6), 96 (5), 84 (6), 83 (100), 82 (100), 81 (10), 69 (26),68 (62), 67 (45). MS (CI): *m*/*z* (%) = 233 (2.4) [M$^+$ + 1], 152 (5), 151 (52), 84 (6), 83 (100), 82 (13), 81 (7), 69 (17), 68 (8). $C_{11}H_{20}O_3S$ (232.34): calcd. C 56.87, H 8.68; found C 57.18, H 8.97.

General Procedure for the Synthesis of ω-Hydrazonosulfonates (*S*)-3 (GP 2): A solution of cyclohexyl sulfonate **2** (1.0 equiv.) in CH_2Cl_2 (7 mL/mmol) was treated with ozone at –78 °C until the solution turned blue. After removal of the excess of ozone the mixture was warmed to room temperature and treated with triphenylphosphane (0.2 g/mmol) and stirred for 1 h. After that the reaction mixture was concentrated under reduced pressure, the crude aldehyde was dissolved in CH_2Cl_2 (3.0 mL/mmol) and treated with SAMP (1.2 equiv.) and $MgSO_4$ (0.4 g/mmol) at 0 °C. The reaction mixture was stirred for 18 h at room temperature, after addition of water the phases were separated and the aqueous phase was extracted three times with CH_2Cl_2. The combined organic phases were dried with $MgSO_4$ and concentrated in vacuo. The pure product was obtained after purification by flash column chromatography.

Cyclohexyl (*S*)-(–)-3-[2-(Methoxymethyl)pyrrolidin-1-ylimino]propane-1-sulfonate [(*S*)-3a]: The cyclohexyl sulfonate **2a** (2.97 g, 13.48 mmol) was treated with ozone at –78 °C and triphenylphosphane (3.54 g, 13.50 mmol). The resulting aldehyde was converted with SAMP (1.97 g, 15.14 mmol, 1.1 equiv.) and $MgSO_4$ (5.18 g) to the desired hydrazone (*S*)-**3a**, which was obtained after flash column chromatography (SiO_2, *n*-pentane/Et_2O, 2:1) as a brown oil. Yield: 3.03 g (68%); R_f = 0.10 (*n*-pentane/Et_2O, 2:1). $[\alpha]_D^{25}$ = –8.4 (*c* = 1.29, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 1.24–2.04 [m, 14 H, $(CH_2)_{cyclo}$, $NCH_2CH_2CH_2$], 2.75 (m, 3 H, $SO_2CH_2CH_2$, NCH*H*), 3.30–3.56 (m, 6 H, NC*H*, NC*H*H, SO_2CH_2, OCH_2), 3.38 (s, 3 H, CH_3), 4.70 (m, 1 H, OC*H*), 6.60 (t, *J* = 4.4 Hz, 1 H, N=C*H*)

ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 22.1 (NCH_2CH_2), 23.5, 24.8, 32.7 [(CH_2)$_{cyclo}$], 26.5 ($NCH_2CH_2CH_2$), 27.1 ($CHCH_2$), 49.1, 49.7 (NCH_2, SCH_2), 59.2 (OCH_3), 63.2 (NCH), 74.4 (OCH_2), 80.9 (OCH), 131.0 (C=N) ppm. IR ($CHCl_3$): $\tilde{\nu}$ = 2937 (vs), 2863 (s), 1600 (w), 1453 (s), 1347 (vs), 1167 (vs), 1119 (s), 1002 (w), 933 (vs), 870 (s), 829 (m), 756 (s), 590 (m), 527 (m) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 332 (5) [M$^+$], 288 (5), 287 (28), 207 (6), 206 (13), 205 (100), 123 (10). MS (CI): *m*/*z* (%) = 334 (7), 333 (37), 332 (11) [M$^+$], 331 (7), 288 (9), 287 (48), 279 (16), 253 (6), 252 (15), 251 (100), 233 (5), 206 (5), 205 (39). $C_{15}H_{28}N_2O_4S$ (332.46): calcd. C 54.19, H 8.49, N 8.43; found C 54.23, H 8.49, N 8.83.

Cyclohexyl (*S*)-(–)-4-[2-(Methoxymethyl)pyrrolin-1-ylimino]butane-1-sulfonate [(*S*)-3b]: The cyclohexyl sulfonate **2b** (2.16 g, 9.31 mmol) was treated with ozone at –78 °C and triphenylphosphane (2.44 g, 9.31 mmol). The resulting aldehyde was converted with SAMP (1.36 g, 10.45 mmol 1.1 equiv.) and $MgSO_4$ (3.58 g) to the desired hydrazone (*S*)-**3b**, which was obtained after flash column chromatography (SiO_2, *n*-pentane/Et_2O, 2:1) as a brown oil. Yield: 2.45 g (76%); R_f = 0.14 (*n*-pentane/Et_2O, 2:1). $[\alpha]_D^{25}$ = –61.2 (*c* = 1.01, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 1.25–2.14 [m, 16 H, (CH_2)$_{cyclo}$, $SO_2CH_2CH_2CH_2$, NCH_2CH_2], 2.37 (m, 2 H, $SO_2CH_2CH_2$), 2.73 (m, 1 H, NC*H*H), 3.15 (m, 2 H, SO_2CH_2), 3.31–3.56 (m, 4 H, NC*H*, NCH*H*, OCH_2), 3.38 (s, 3 H, OCH_3), 4.69 (m, 1 H, OC*H*), 6.57 (t, *J* = 4.9 Hz, 1 H, N=C*H*) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 21.5 ($SO_2CH_2CH_2$), 22.1 (NCH_2CH_2), 23.5, 24.9, 32.7 [(CH_2)$_{cyclo}$], 26.5 ($NCH_2CH_2CH_2$), 31.1 (C=NCH_2), 49.9 (NCH_2), 50.7 (SO_2CH_2), 59.1 (OCH_3), 63.3 (NCH), 74.6 (CH_2OCH_3), 80.7 (OCH), 134.4 (C=N) ppm. IR ($CHCl_3$): $\tilde{\nu}$ = 2939 (vs), 2863 (vs), 1725 (m), 1601 (w), 1453 (w), 1343 (vs), 1168 (vs), 1119 (vs), 1031 (w), 1004 (w), 936 (vs), 869 (vs), 829 (m), 756 (m), 587 (m), 530 (m), 486 (w) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 346 (4) [M$^+$], 302 (7), 301 (33), 221 (5), 220 (13), 219 (100), 70 (8). MS (CI): *m*/*z* (%) = 350 (11), 349 (33), 348 (71), 346 (12), 345 (12), 303 (6), 302 (11), 301 (38), 298 (10), 293 (26), 267 (13), 266 (38), 265 (100), 219 (28). $C_{16}H_{30}N_2O_4S$ (346.49): calcd. C 55.46, H 8.73, N 8.09; found C 55.65, H 8.75, N 7.79.

General Procedure for the Synthesis of ω-Hydrazinosulfonates (GP 3): $CeCl_3 \cdot 7H_2O$ (4–5 equiv.) were dehydrated for 2 h at 130 °C in vacuo (0.1 Torr) and then suspended in dry THF (3.0 mL/mmol) with sonification. The suspension was stirred overnight at room temperature. After cooling to –78 °C 4–5 equiv. of lithium- or Grignard reagent were added and stirred for 2 h at this temperature. To this resulting yellow suspension 1.0 equiv. of hydrazone (*S*,*S*)-**4**, dissolved in dry THF (4.0 mL/mmol), was added at –100 °C. The solution was warmed to –78 °C within 3 h. The reaction mixture was quenched with pH 7 buffer solution at this temperature and then warmed to room temperature. The mixture was extracted three times with CH_2Cl_2, the combined organic layers were dried with $MgSO_4$ and concentrated in vacuo. The pure hydrazine was obtained after purification by flash column chromatography (SiO_2, *n*-pentane/Et_2O).

Cyclohexyl (*R*,*S*)-(–)-3-[2-(Methoxymethyl)pyrrolidin-1-ylamino]butane-1-sulfonate [(*R*,*S*)-4a]: Prepared according to GP 3 by 1,2-addition of $CeCl_3 \cdot 7H_2O$ (1.86 g, 5.0 mmol) and MeLi (3.14 mL, 5.0 mmol) to the hydrazone (*S*)-**3a** (0.333 g, 1.0 mmol). Compound (*R*,*S*)-**4a** was obtained after flash column chromatography (SiO_2, *n*-pentane/Et_2O, 2:1) as a colourless oil. Yield: 0.321 g (92%); R_f = 0.10 (*n*-pentane/Et_2O, 2:1), *de* = 82% (^{13}C NMR), $[\alpha]_D^{25}$ = –26.1 (*c* = 1.34, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 1.03 (d, *J* = 6.3 Hz, 3 H, CH_3), 1.22–1.45 (m, 3 H, $OCHCH_2CH_2CH$H), 1.47–1.69 (m, 4 H, NCH_2CH_2CHH, $OCHCH_2CH_2CH$H), 1.69–1.81 (m, 4 H, NCH_2CH_2, $OCHCH_2CH_2$), 1.85–2.03 (m, 5 H, $CHCH_2$, NCH_2CH_2CHH, $OCHCH_2$), 2.35 (td, *J* = 9.0 Hz, *J* = 9.0 Hz, 1 H, NC*H*H), 2.63 (m, 1 H, NC*H*), 3.06 (m, 1 H, C*H*), 3.11–3.31 (m, 3 H, SCH_2, NCH*H*), 3.34 (s, 3 H, OCH_3), 3.35 (m, 1 H, OC*H*H), 3.47 (dd, *J* = 5.2 Hz, *J* = 9.3 Hz, 1 H, OCH*H*), 4.69 [m, 1 H, C*H*(CH_2)$_{cyclo}$] ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 18.9 (CH_3), 21.0 (NCH_2CH_2), 23.5 24.9, 32.7 [(CH_2)$_{cyclo}$], 26.2 ($NCH_2CH_2CH_2$), 29.1 ($CHCH_2$), 48.0 (SCH_2), 52.4 (CH), 57.9 (NCH_2), 59.0 (OCH_3), 66.1 (NCH), 75.4 (OCH_2), 80.6 [*C*H-(CH_2)$_{cyclo}$] ppm. IR ($CHCl_3$): $\tilde{\nu}$ = 3019 (m), 2939 (vs), 2864 (s), 1452 (m), 1343 (s), 1216 (m), 1165 (s), 1115 (m), 932 (vs), 870 (m), 830 (m), 757 (vs), 668 (m), 531 (w) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 348 (5) [M$^+$], 266 (11), 223 (5), 221 (100), 141 (7), 129 (8), 125 (5), 83 (5), 70 (8), 55 (8). $C_{16}H_{32}N_2O_4S$ (348.50): calcd. C 55.14, H 9.25, N 8.04; found C 55.31, H 9.70, N 7.40.

Cyclohexyl (*R*,*S*)-(–)-3-[2-(Methoxymethyl)pyrrolidin-1-ylamino]-pentane-1-sulfonate [(*R*,*S*)-4b]: Prepared according to GP 3 by 1,2-addition of $CeCl_3 \cdot 7H_2O$ (2.05 g, 5.5 mmol) and ethylmagnesium bromide (5.5 mL, 5.5 mmol) to the hydrazone (*S*)-**3a** (0.382 g, 1.10 mmol). Compound (*R*,*S*)-**4b** was obtained after flash column chromatography (SiO_2, *n*-pentane/Et_2O, 1:1) as a colourless oil. Yield: 0.392 g (98%); R_f = 0.28 (*n*-pentane/Et_2O, 1:1); *de* = 78% (^{13}C NMR). $[\alpha]_D^{25}$ = –37.8 (*c* = 1.11, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 0.87 (t, *J* = 7.4 Hz, 3 H, CH_3), 1.20–2.05 [m, 18 H, (CH_2)$_{cyclo}$, CH_2CH_3, $SO_2CH_2CH_2$, $NCH_2CH_2CH_2$], 2.31 (td, *J* = 8.8 Hz, *J* = 8.8 Hz, 1 H, NC*H*H), 2.58 (m, 1 H, NC*H*), 2.80 (m, 1 H, C*H*), 3.09–3.27 (m, 3 H, SO_2CH_2, NCH*H*), 3.29 (s, 3 H, OCH_3), 3.31 (m, 1 H, OC*H*H), 3.42 (dd, *J* = 5.3 Hz, *J* = 9.4 Hz, 1 H, OCH*H*), 4.65 [m, 1 H, C*H*(CH_2)$_{cyclo}$] ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 10.2 (CH_3), 21.2 (NCH_2CH_2), 23.66, 25.06, 25.25, 26.36, 32.94 [(CH_2)$_{cyclo}$, $CHCH_2$, $NCH_2CH_2CH_2$, CH_2CH_3], 48.0 (SCH_2), 58.21 (NCH_2), 58.6 (CH), 59.1 (OCH_3), 66.5 (NCH), 75.6 (OCH_2), 80.7 [*C*H(CH_2)$_{cyclo}$] ppm. IR ($CHCl_3$): $\tilde{\nu}$ = 2938 (vs), 2866 (vs), 1724 (w), 1455 (s), 1347 (vs), 1234 (w), 1166 (vs), 1113 (s), 1032 (w), 1005 (w), 935 (vs), 870 (vs), 830 (m), 756 (w), 590 (w), 531 (w) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 362 (7), 280 (14), 236 (11), 235 (100), 155 (6), 129 (10), 125 (5), 70 (12), 55 (6). $C_{17}H_{34}N_2O_4S$ (362.53): calcd. C 56.32, H 9.45, N 7.73; found C 56.40, H 9.51, N 7.65.

Cyclohexyl (*R*,*S*)-(–)-3-[2-(Methoxymethyl)pyrrolidin-1-ylamino]-heptane-1-sulfonate [(*R*,*S*)-4c]: Prepared according to GP 3 by 1,2-addition of $CeCl_3 \cdot 7H_2O$ (2.24 g, 6.0 mmol) and *n*BuLi (2.4 mL, 6.0 mmol) to the hydrazone (*S*)-**3a** (0.499 g, 1.5 mmol). Compound (*R*,*S*)-**4c** was obtained after flash column chromatography (SiO_2, *n*-pentane/Et_2O, 1:1) as a colourless oil. Yield: 0.520 g (89%); R_f = 0.44 (*n*-pentane/Et_2O, 1:1); *de* = 87% (^{13}C NMR). $[\alpha]_D^{25}$ = –28.8 (*c* = 0.99, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 0.87 (t, *J* = 7.4 Hz, 3 H, CH_3), 1.20–2.05 [m, 22 H, (CH_2)$_3CH_3$, (CH_2)$_{cyclo}$, $SO_2CH_2CH_2$, $NCH_2CH_2CH_2$], 2.38 (td, *J* = 8.8 Hz, *J* = 8.8 Hz, 1 H, NC*H*H), 2.63 (m, 1 H, NC*H*), 2.92 (m, 1 H, NHC*H*), 3.10–3.52 (m, 5 H, SO_2CH_2, CH_2O, NCH*H*), 3.35 (s, 3 H, OCH_3), 4.68 [m, 1 H, C*H*(CH_2)$_{cyclo}$] ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 14.1 (CH_3), 21.1 (NCH_2CH_2), 23.0 (CH_2CH_3), 23.5, 24.9, 32.8 [(CH_2)$_{cyclo}$], 26.3 ($NCH_2CH_2CH_2$), 26.7 ($CH_2CH_2CH_3$), 28.0 ($SO_2CH_2CH_2$), 32.2 ($CH_2CH_2CH_2CH_3$), 47.9 (SCH_2), 57.2 (NCH_2), 58.3 (CH), 59.0 (OCH_3), 66.5 (NCH), 75.6 (OCH_2), 80.6 [*C*H(CH_2)$_{cyclo}$] ppm. IR ($CHCl_3$): $\tilde{\nu}$ = 2935 (vs), 2862 (vs), 1720 (m), 1453 (s), 1411 (w), 1346 (vs), 1168 (vs), 1117 (m), 1004 (w), 937 (vs), 869 (s), 831 (m), 531 (m) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 390 (6) [M$^+$], 308 (16), 265 (6), 264 (13), 263 (100), 129 (12), 70 (11), 55 (8). HRMS, $C_{19}H_{38}N_2O_4S$: calcd. 390.2552; found 390.2551.

Cyclohexyl (*R*,*S*)-(–)-3-[2-(Methoxymethyl)pyrrolidin-1-ylamino]-nonane-1-sulfonate [(*R*,*S*)-4d]: Prepared according to GP 3 by 1,2-

addition of $CeCl_3 \cdot 7H_2O$ (2.24 g, 6.0 mmol) and *n*HexLi (2.3 mL, 6.0 mmol) to the hydrazone (*S*)-**3a** (0.499 g, 1.5 mmol). Compound (*R*,*S*)-**4d** was obtained after flash column chromatography (SiO_2, *n*-pentane/Et_2O, 1:1) as a colourless oil. Yield: 0.492 g (78%); R_f = 0.5 (*n*-pentane/Et_2O, 1:1); *de* = 90% (^{13}C NMR). $[\alpha]_D^{25}$ = –34.3 (*c* = 1.16, $CHCl_3$). ^1H NMR (400 MHz, $CDCl_3$): δ = 0.89 (t, *J* = 6.9 Hz, 3 H, C*H*$_3$), 1.24–2.12 [m, 26 H, (C*H*$_2$)$_5$CH$_3$, (C*H*$_2$)$_{cyclo}$, $SO_2CH_2CH_2$, $NCH_2CH_2CH_2$], 2.38 (td, *J* = 8.8 Hz, *J* = 8.8 Hz, 1 H, NC*H*H), 2.64 (m, 1 H, NC*H*), 2.92 (m, 1 H, NHC*H*), 3.10–3.29 (m, 3 H, SO_2CH_2, NCH*H*), 3.34 (s, 3 H, OC*H*$_3$), 3.36 (m, 1 H, OC*H*H), 3.46 (m, 1 H, OCH*H*), 4.69 [m, 1 H, C*H*(CH$_2$)$_{cyclo}$] ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 14.1 (*C*H$_3$), 21.0 (NCH_2CH_2), 22.6 (*C*H$_2$CH$_3$), 23.5, 24.9, 32.8 [(*C*H$_2$)$_{cyclo}$], 25.8 ($NCH_2CH_2CH_2$), 26.3, 26.7, 29.5, 31.8, 32.5 [CH*C*H$_2$, (*C*H$_2$)$_4$-CH$_2$CH$_3$], 47.8 (S*C*H$_2$), 57.1 (*C*H), 58.1 (N*C*H$_2$), 58.9 (O*C*H$_3$), 66.4 (N*C*H), 75.5 (O*C*H$_2$), 80.5 [*C*H(CH$_2$)$_{cyclo}$] ppm. IR ($CHCl_3$): $\tilde{\nu}$ = 2932 (vs), 2860 (vs), 1720 (m), 1455 (s), 1346 (vs), 1168 (vs), 1115 (m), 1004 (w), 935 (vs), 869 (s), 830 (m), 756 (s), 589 (w), 530 (m) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 418 (6), 336 (19), 293 (6), 292 (15), 291 (100), 289 (5), 235 (6), 211 (8), 129 (13), 125 (13), 83 (6), 82 (5), 70 (10), 67 (7), 55 (9), 45 (5). $C_{21}H_{42}N_2O_4S$ (418.63), calcd. C 60.25, H 10.11, N 6.69; found C 59.93, H 10.45, N 6.46.

Cyclohexyl (*S*,*S*)-(+)-3-[2-(Methoxymethyl)pyrrolidin-1-ylamino]-3-phenylpropane-1-sulfonate [(*S*,*S*)-4e]: Prepared according to GP 3 by 1,2-addition of $CeCl_3 \cdot 7H_2O$ (2.24 g, 6.0 mmol) and PhLi (3.41 mL, 6 mmol) to the hydrazone (*S*)-**3a** (0.499 g, 1.50 mmol). Compound (*S*,*S*)-**4e** was obtained after flash column chromatography (SiO_2, *n*-pentane/Et_2O, 1:1) as a colourless oil. Yield: 0.616 g (99%); R_f = 0.31 (*n*-pentane/Et_2O, 1:1); *de* ≥ 96% (^{13}C NMR). $[\alpha]_D^{25}$ = +23.4 (*c* = 1.01, $CHCl_3$). ^1H NMR (400 MHz, $CDCl_3$): δ = 1.24–1.36 (m, 3 H, OCHCH$_2$C*H*$_2$C*H*H), 1.43–1.62 (m, 4 H, NCH$_2$CH$_2$C*H*H, OCHC*H*$_2$CH$_2$CH*H*), 1.70 (m, 4 H, NCH$_2$C*H*$_2$, OCHCH$_2$C*H*$_2$), 1.88 (m, 3 H, NCH$_2$CH$_2$CH*H*, OCHC*H*$_2$), 2.21 (m, 1 H, CHC*H*H), 2.34 (m, 1 H, CHCH*H*), 2.44 (td, *J* = 8.6 Hz, *J* = 8.7 Hz, 1 H, NC*H*H), 2.67 (m, 1 H, NC*H*), 2.99 (dd, *J* = 7.4 Hz, *J* = 8.5 Hz, 3 H, SC*H*$_2$), 3.23 (m, 1 H, NCH*H*), 3.27 (s, 3 H, OC*H*$_3$), 3.42 (m, 1 H, OC*H*H), 3.48 (m, 1 H, OCH*H*), 4.01 (dd, *J* = 5.0 Hz, *J* = 8.0 Hz, 1 H, C*H*), 4.60 [m, 1 H, C*H*(CH$_2$)$_{cyclo}$], 7.24–7.38 (m, 5 H, Ph*H*) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 21.0 (NCH_2CH_2), 23.5, 24.8, 32.7 [(*C*H$_2$)$_{cyclo}$], 26.4 ($NCH_2CH_2CH_2$), 29.4 (CH*C*H$_2$), 48.2 (S*C*H$_2$), 57.9 (N*C*H$_2$), 58.9 (O*C*H$_3$), 62.2 (*C*H), 66.2 (N*C*H), 75.5 (O*C*H$_2$), 80.8 [*C*H-(CH$_2$)$_{cyclo}$], 127.4, 127.4, 128.3 (*C*Ph), 141.4 (*ipso*-*C*Ph) ppm. IR ($CHCl_3$): $\tilde{\nu}$ = 3454 (w), 3061 (m), 3028 (m), 2939 (vs), 2863 (vs), 1687 (m), 1603 (w), 1494 (w), 1451 (s), 1348 (vs), 1266 (w), 1236 (w), 1168 (vs), 1114 (s), 1030 (w), 1004 (w), 933 (vs), 871 (vs), 829 (m), 758 (vs), 703 (s), 531 (m) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 411 (7), 410 (28) [M^+], 394 (11), 328 (7), 283 (21), 281 (11), 215 (8), 214 (12), 203 (34), 197 (9), 130 (16), 129 (100), 117 (17), 106 (7), 105 (47), 84 (24), 83 (37), 77 (8), 70 (9), 67 (9), 55 (11), 54 (7), 46 (7), 45 (16). MS (CI): *m*/*z* (%) = 411 (21), 410 (15), 409 (10), 363 (19), 357 (17), 330 (14), 329 (78), 327 (14), 311 (7), 281 (9), 245 (7), 243 (10), 217 (6), 216 (11), 214 (100), 203 (6), 197 (14), 132 (15), 129 (18), 105 (12). $C_{21}H_{34}N_2O_4S$ (410.57) calcd. C 61.43, H 8.35, N 6.82; found C 61.32, H 8.14, N 6.64.

Cyclohexyl (*R*,*S*)-4-[2-(Methoxymethyl)pyrrolidin-1-ylamino]pentane-1-sulfonate [(*R*,*S*)-4f]: Prepared according to GP 3 by 1,2-addition of $CeCl_3 \cdot 7H_2O$ (1.863 g, 5.0 mmol) and MeLi (3.1 mL, 5.0 mmol) to hydrazone (*S*)-**3b** (347 mg, 1.0 mmol). Compound (*R*,*S*)-**4f** was obtained after flash column chromatography (SiO_2, *n*-pentane/Et_2O, 1:1) as a yellow oil. Yield: 283 mg (78%); R_f = 0.16 (*n*-pentane/Et_2O, 1:1); *de* = 82% (^{13}C NMR). ^1H NMR (300 MHz, $CDCl_3$): δ = 1.03 (d, *J* = 6.1 Hz, 3 H, C*H*$_3$), 1.25–2.02 [m, 18 H, $SO_2CH_2CH_2CH_2$, $NCH_2CH_2CH_2$. (C*H*$_2$)$_{cyclo}$], 2.35 (m, 1 H, NC*H*H), 2.59 (m, 1 H, NC*H*), 2.89 (m, 1 H, C*H*NH), 3.09 (m, 2 H, SO_2CH_2), 3.30–3.38 (m, 4 H, NCH*H*, OC*H*H), 3.36 (s, 3 H, OC*H*$_3$), 3.49 (m, 1 H, OCH*H*), 4.70 (m, 1 H, OC*H*) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 19.4 (*C*H$_3$), 20.2 ($SO_2CH_2CH_2$), 21.0 (NCH_3CH_2), 23.5, 24.8, 32.8 [(*C*H$_2$)$_{cyclo}$], 26.1 ($NCH_2CH_2CH_2$), 34.2 ($SO_2CH_2CH_2CH_2$), 51.6 (SO_2CH_2), 53.5 (NH*C*H), 57.8 (N*C*H$_2$), 59.0 (O*C*H$_3$), 66.0 (N*C*H), 75.1 (O*C*H$_2$), 80.7 (O*C*H) ppm. The structure was corroborated by the reactions involved in the next step.

Cyclohexyl (*R*,*S*)-4-[2-(Methoxymethyl)pyrrolidin-1-ylamino]octane-1-sulfonate [(*R*,*S*)-4g]: Prepared according to GP 3 by 1,2-addition of $CeCl_3 \cdot 7H_2O$ (1.863 g, 5.0 mmol) and *n*BuLi (3.1 mL, 5.0 mmol) to the hydrazone (*S*)-**3b** (347 mg, 1.0 mmol). Compound (*R*,*S*)-**4g** was obtained after flash column chromatography (SiO_2, *n*-pentane/Et_2O, 1:1) as a yellow oil. Yield: 379.7 mg (94%); R_f = 0.16 (*n*-pentane/Et_2O, 1:1); *de* ≥ 96% (^{13}C NMR). $[\alpha]_D^{25}$ = –29.0 (*c* = 1.11, $CHCl_3$). ^1H NMR (300 MHz, $CDCl_3$): δ = 0.91 (t, *J* = 6.9 Hz, 3 H, C*H*$_3$), 1.25–1.98 [m, 24 H, CH$_3$C*H*$_2$C*H*$_2$C*H*$_2$, $SO_2CH_2CH_2CH_2$, $NCH_2CH_2CH_2$. (C*H*$_2$)$_{cyclo}$], 2.28 (m, 1 H, NC*H*H), 2.61 (m, 1 H, NC*H*), 2.77 (m, 1 H, C*H*NH), 3.10 (m, 1 H, SO_2CH_2), 3.26–3.53 (m, 4 H, NCH*H*, OC*H*$_2$), 3.36 (s, 3 H, OC*H*$_3$), 4.71 (m, 1 H, OC*H*) ppm. ^{13}C NMR (75 MHz, $CDCl_3$): δ = 14.1 (*C*H$_3$CH$_2$), 20.0 ($SO_2CH_2CH_2$), 21.0 (NCH_3CH_2), 23.1 (CH$_3$*C*H$_2$), 23.5, 24.9, 32.8 [(*C*H$_2$)$_{cyclo}$], 26.2 ($NCH_2CH_2CH_2$), 27.7 (CH$_3$CH$_2$*C*H$_2$), 31.7, 32.6 ($SO_2CH_2CH_2CH_2$, CH$_3$CH$_2$CH$_2$*C*H$_2$), 51.9 (SO_2CH_2), 58.0 (N*C*H$_2$), 58.1 (NH*C*H), 59.1 (O*C*H$_3$), 66.3 (N*C*H), 75.2 (O*C*H$_2$), 80.8 (O*C*H) ppm. The structure was corroborated by the reactions involved in the next step.

Cyclohexyl (*R*,*S*)-4-[2-(Methoxymethyl)pyrrolidin-1-ylamino]decane-1-sulfonate [(*R*,*S*)-4h]: Prepared according to GP 3 by 1,2-addition of $CeCl_3 \cdot 7H_2O$ (7.45 g, 20.0 mmol) and *n*HexLi (7.7 mL, 20.0 mmol) to the hydrazone (*S*)-**3b** (1.73 g, 5.0 mmol). Compound (*R*,*S*)-**4h** was obtained after flash column chromatography (SiO_2, *n*-pentane/Et_2O, 1:1) as a yellow oil. Yield: 1.62 g (75%); R_f = 0.33 (*n*-pentane/Et_2O, 1:1); *de* ≥ 96% (^{13}C NMR). ^1H NMR (400 MHz, $CDCl_3$): δ = 0.89 (t, *J* = 7.2 Hz, 3 H, C*H*$_3$), 1.24–2.05 [m, 28 H, CH$_3$ (C*H*$_2$)$_5$, $SO_2CH_2CH_2CH_2$, $NCH_2CH_2CH_2$, (C*H*$_2$)$_{cyclo}$], 2.25 (m, 1 H, NC*H*H), 2.60 (m, 1 H, NC*H*), 2.76 (m, 1 H, NHC*H*), 3.11 (m, 3 H, NCH*H*, SO_2CH_2), 3.30–3.50 (m, 2 H, OC*H*$_2$), 3.35 (s, 3 H, OC*H*$_3$), 4.70 (m, 1 H, OC*H*) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 14.1 (*C*H$_3$), 19.9 ($SO_2CH_2CH_2$), 21.0 (NCH_2CH_2), 22.6 (*C*H$_2$CH$_3$), 23.5, 24.9, 32.8 [(*C*H$_2$)$_{cyclo}$], 25.5 (*C*H$_2$CH$_2$CH$_2$CH$_2$CH$_3$), 26.1 ($NCH_2CH_2CH_2$), 29.7 (*C*H$_2$CH$_2$CH$_2$CH$_3$), 31.6, 31.9 (*C*H$_2$CH$_2$CH$_3$, $SO_2CH_2CH_2CH_2$), 35.4 (*C*H$_2$CH$_2$CH$_2$CH$_2$CH$_2$CH$_3$), 51.8 (SO_2CH_2), 57.9 (N*C*H$_2$), 58.0 (NH*C*H), 59.0 (O*C*H$_3$), 66.2 (N*C*H), 75.1 (O*C*H$_2$), 80.8 (O*C*H) ppm. The structure was corroborated by the reactions involved in the next step.

Cyclohexyl (*S*,*S*)-4-[2-(Methoxymethyl)pyrrolidin-1-ylamino]-4-(phenyl)butane-1-sulfonate [(*S*,*S*)-4i]: Prepared according to GP 3 by 1,2-addition of $CeCl_3 \cdot 7H_2O$ (7.45 g, 20.0 mmol) and PhLi (11.8 mL, 20.0 mmol) to the hydrazone (*S*)-**3b** (1.20 g, 3.46 mmol). Compound (*S*,*S*)-**4i** was obtained after flash column chromatography (SiO_2, *n*-pentane/Et_2O, 1:1) as a yellow oil. Yield: 1.13 g (77%), R_f = 0.29 (*n*-pentane/Et_2O, 1:1); *de* ≥ 96% (^{13}C NMR). ^1H NMR (400 MHz, $CDCl_3$): δ = 1.24–1.98 [m, 18 H, $SO_2CH_2CH_2CH_2$, $NCH_2CH_2CH_2$, (C*H*$_2$)$_{cyclo}$], 2.35 (td, *J* = 8.5 Hz, *J* = 8.8 Hz, 1 H, NC*H*H), 2.61 (m, 1 H, NC*H*), 2.99 (m, 2 H, SO_2CH_2), 3.14 (dd, *J* = 5.8 Hz, *J* = 9.3 Hz, 1 H, OC*H*H), 3.24 (s, 3 H, OC*H*$_3$), 3.30 (m, 1 H, NCH*H*), 3.39 (dd, *J* = 4.7 Hz, *J* = 9.3 Hz, 1 H, OCH*H*), 3.85 (dd, *J* = 4.9 Hz, *J* = 8.0 Hz, 1 H,

C*H*NH), 4.59 [m, 1 H, C*H*$(CH_2)_{cyclo}$], 7.28–7.32 (m, 5 H, Ph*H*) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 20.4 ($SO_2CH_2CH_2$), 21.0 (NCH_2CH_2), 23.4, 24.8, 32.6 [$(CH_2)_{cyclo}$], 26.3 ($NCH_2CH_2CH_2$), 34.2 ($SO_2CH_2CH_2CH_2$), 51.4 (SO_2CH_2), 57.7 (NCH_2), 58.8 (OCH_3), 63.6 (N*C*H), 66.0 (NH*C*H), 75.1 (OCH_2), 80.8 (O*C*H), 127.1, 127.5, 128.0 (*C*Ph), 142.6 (*ipso*-*C*Ph) ppm. The structure was corroborated by the reactions involved in the next step.

General Procedure for the N,N-Bond Cleavage and Protection of the Amino Group (GP 4): The hydrazine **4** (1.0 equiv.) was dissolved in dry THF (10.0 mL/mmol), then BH_3·THF (12 equiv.) was added, and the solution was heated to reflux for 4 h. The reaction mixture was cooled to 0 °C, hydrolysed with methanol (30 mL/mmol) and heated for another 20 min. The solvent was removed under reduced pressure, and the residue was dissolved in CH_2Cl_2 (17 mL/mmol), treated with K_2CO_3 (5.3 equiv.) and CbzCl (5.2 equiv.) and heated to reflux for 18 h. After that, the reaction mixture was quenched with water and the aqueous portion was extracted three times with CH_2Cl_2. The combined organic layers were dried with $MgSO_4$ and the solvent was removed in a rotary evaporator. The residue was purified by flash column chromatography (SiO_2, *n*-pentane/Et_2O).

Cyclohexyl (*R*)-(–)-3-(Benzyloxycarbonylamino)butanesulfonate [(*R*)-5a]: Prepared as described in GP 4; N–N bond cleavage of the hydrazine (*R*,*S*)-**4a** (0.081 g, 0.23 mmol) with BH_3·THF (2.8 mL, 12 equiv.) afforded the crude amine, which was directly converted into the carbamic acid benzyl ester (*S*)-**5a** by treatment with K_2CO_3 (168 mg, 1.22 mmol) and CbzCl (0.17 mL, 1.20 mmol). Compound (*R*)-**5a** was obtained as a colourless oil after flash column chromatography (SiO_2, *n*-Pentan/Et_2O, 2:1). Yield: 44 mg (50%); R_f = 0.11 (*n*-pentane/Et_2O, 2:1); *ee* = 84% (determined by HPLC on chiral stationary phase, Daicelod M). $[a]_D^{25}$ = –3.2 (*c* = 1.09, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 1.20 (d, *J* = 6.3 Hz, 3 H, C*H*$_3$), 1.22–1.99 [m, 10 H, (C*H*$_2$)$_{cyclo}$], 2.00 (m, 2 H, CHC*H*$_2$), 3.12 (t, *J* = 8.0 Hz 2 H, SC*H*$_2$), 3.83 (m, 1 H, C*H*), 4.68 (m, 1 H, OC*H*), 4.83 (br. s, 1 H, N*H*), 5.08 (s, 2 H, OC*H*$_2$), 7.34 (m, 5 H, Ph*H*) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 21.2 (*C*H$_3$), 31.0 (CH*C*H$_2$), 23.4, 24.8, 32.7 [(*C*H$_2$)$_{cyclo}$], 46.0 (*C*H), 48.6 (S*C*H$_2$), 66.7 (*C*H$_2$Ph), 81.1 (O*C*H), 127.9, 128.0, 128.4 (*C*Ph), 136.1 (*ipso*-*C*Ph), 155.6 (*C*=O) ppm. IR ($CHCl_3$): $\tilde{\nu}$ = 3065 (w), 3034 (w), 2939 (vs), 2863 (s), 2362 (w), 2336 (w), 1347 (vs), 1289 (w), 1248 (vs), 1166 (vs), 1093 (m), 1064 (s), 1027 (m), 932 (vs), 870 (s), 831 (m), 750 (s), 699 (m), 669 (w), 587 (m), 534 (w), 463 (w) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 369 (0.5), 288 (5), 287 (28), 152 (5), 134 (12), 109 (8), 108 (100), 107 (23), 92 (6), 91 (82), 83 (5), 70 (5), 55 (9). MS (CI): *m*/*z* (%) = 370 (6), 316 (5), 290 (6), 289 (15), 288 (100), 287 (11), 272 (9), 270 (10), 244 (30), 180 (7), 119 (6), 108 (10), 91 (39), 83 (6). $C_{18}H_{27}NO_5S$ (369.47): calcd. C 58.51, H 7.37, N 3.79; found C 58.36, H 7.15, N 3.62.

Cyclohexyl (*R*)-(+)-3-(Benzyloxycarbonylamino)pentanesulfonate [(*R*)-5b]: Prepared as described in GP 4; N–N bond cleavage of hydrazine (*R*,*S*)-**4b** (0.149 g, 0.41 mmol) with BH_3·THF (5.0 mL, 12 equiv.) afforded the crude amine, which was directly converted into the carbamic acid benzyl ester (*R*)-**5b** by treatment with K_2CO_3 (300 mg, 2.17 mmol) and CbzCl (0.30 mL, 2.13 mmol). Compound (*R*)-**5b** was obtained as a colourless solid after flash column chromatography (SiO_2, *n*-pentane/Et_2O, 2:1). Yield: 0.113 g (71%); R_f = 0.34 (*n*-pentane/Et_2O, 2:1): *ee* = 78% (determined by HPLC on chiral stationary phase, Daicelod M). $[a]_D^{25}$ = +1.9 (*c* = 1.46, $CHCl_3$); m.p. 74 °C. ^{1}H NMR (400 MHz, $CDCl_3$): δ = 0.93 (t, *J* = 7.4 Hz, 3 H, C*H*$_3$), 1.20–1.90 [m, 12 H, C*H*$_2$CH$_3$, (C*H*$_2$)$_{cyclo}$], 1.95 (m, 1 H, CHC*H*H) 2.09 (m, 1 H, CHCH*H*), 3.14 (t, *J* = 8.3 Hz 2 H, SC*H*$_2$), 3.64 (m, 1 H, C*H*), 4.68 (m, 1 H, OC*H*), 4.75 (br. s, 1 H, N*H*), 5.09 (s, 2 H, OC*H*$_2$), 7.35 (m, 5 H, Ph*H*) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 10.2 (*C*H$_3$), 23.5, 24.8, 32.7 [(*C*H$_2$)$_{cyclo}$], 28.3 (C*H*$_2$CH$_3$), 29.2 (CH*C*H$_2$), 48.7 (S*C*H$_2$), 51.6 (*C*H), 66.7 (*C*H$_2$Ph), 81.1 (O*C*H), 127.8, 128.0, 128.4 (*C*Ph), 136.2 (*ipso*-*C*Ph), 156.1 (*C*=O) ppm. IR (KBr): $\tilde{\nu}$ = 3362 (vs, br.), 3037 (w), 2936 (s), 2869 (m), 1696 (vs), 1525 (vs), 1452 (m), 1414 (w), 1385 (w), 1355 (s), 1299 (s), 1266 (m), 1233 (vs), 1170 (vs), 1093 (m), 1069 (m), 1043 (w), 1000 (m), 939 (vs), 893 (w), 867 (m), 833 (m), 778 (w), 755 (w), 729 (m), 695 (m), 645 (m), 601 (m), 537 (m), 515 (w), 458 (w) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 302 (5), 301 (27), 272 (8), 228 (19), 192 (9), 165 (6), 148 (15), 146 (6), 109 (6), 108 (78), 106 (15), 92 (8), 91 (100), 83 (5), 55 (6). MS (CI): *m*/*z* (%) = 384 (9), 312 (5), 304 (6), 303 (16), 302 (100), 301 (21), 286 (12), 284 (20), 272 (5), 259 (10), 258 (66), 228 (7), 193 (9), 119 (8), 108 (20), 106 (5), 92 (5), 91 (69). $C_{19}H_{29}NO_5S$ (383.50): calcd. C 59.51, H 7.62, N 3.65; found C 59.37, H 7.73, N 3.59.

Cyclohexyl (*R*)-(+)-3-(Benzyloxycarbonylamino)heptanesulfonate [(*R*)-5c]: Prepared as described in GP 4; N–N bond cleavage of hydrazine (*R*,*S*)-**4c** (520 mg, 1.33 mmol) with BH_3·THF (16.0 mL, 12 equiv.) afforded the crude amine, which was directly converted into the carbamic acid benzyl ester (*R*)-**5c** by treatment with K_2CO_3 (0.97 g, 7.05 mmol) and CbzCl (0.99 mL, 6.92 mmol). Compound (*R*)-**5c** was obtained as a colourless oil after flash column chromatography (SiO_2, *n*-pentane/Et_2O, 1:1). Yield: 542 mg (99%), R_f = 0.49 (*n*-pentane/Et_2O, 1:1); *ee* = 87% (based on the *de* value of the corresponding hydrazine). $[a]_D^{25}$ = +1.58 (*c* = 1.01, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 0.88 (t, *J* = 7.4 Hz, 3 H, C*H*$_3$), 1.23–2.20 [m, 18 H, CHC*H*$_2$, (C*H*$_2$)$_3$CH$_3$, (C*H*$_2$)$_{cyclo}$], 3.14 (t, *J* = 8.3 Hz, 2 H, SC*H*$_2$), 3.64 (m, 1 H, C*H*), 4.67 (m, 1 H, OC*H*), 4.79 (br. d, *J* = 9.1 Hz, 1 H, N*H*), 5.09 (s, 2 H, OC*H*$_2$), 7.34 (m, 5 H, Ph*H*) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 13.9 (*C*H$_3$), 22.4 (*C*H$_2$CH$_3$), 23.5, 24.8, 32.7 [(*C*H$_2$)$_{cyclo}$], 27.9 (C*H*$_2$CH$_2$CH$_3$), 29.6 (CH*C*H$_2$), 35.1 (C*H*$_2$CH$_2$CH$_2$CH$_3$), 48.6 (S*C*H$_2$), 50.2 (*C*H), 66.7 (*C*H$_2$Ph), 81.0 (O*C*H), 127.8, 128.0, 128.4 (*C*Ph), 136.2 (*ipso*-*C*Ph), 156.0 (*C*=O) ppm. IR ($CHCl_3$): $\tilde{\nu}$ = 3501 (m, br.), 3337 (m), 3029 (w), 2937 (vs), 2862 (s), 1701 (vs), 1530 (vs), 1453 (s), 1415 (m), 1346 (vs), 1241 (s), 1166 (vs), 1106 (m), 1074 (w), 1035 (m), 932 (vs), 869 (s), 831 (m), 756 (vs), 698 (m), 667 (w), 529 (w) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 330 (5), 329 (25), 272 (15), 228 (25), 220 (12), 194 (9), 176 (18), 146 (5), 108 (55), 107 (12), 92 (9), 91 (100), 83 (5), 55 (8). HRMS, $C_{21}H_{33}NO_5S$: calcd. $C_{21}H_{33}NO_5S$ – C_6H_{10} = 329.1297; found 329.1298.

Cyclohexyl (*R*)-(+)-3-(Benzyloxycarbonylamino)nonanesulfonate [(*R*)-5d]: Prepared as described in GP 4; N–N bond cleavage of hydrazine (*R*,*S*)-**4d** (691 mg, 1.65 mmol) with BH_3·THF (3.5 mL, 12 equiv.) afforded the crude amine, which was directly converted into the carbamic acid benzyl ester (*R*)-**5d** by treatment with K_2CO_3 (1.22 g, 8.75 mmol) and CbzCl (1.22 mL, 8.58 mmol). Compound (*R*)-**5d** was obtained as a colourless solid after flash column chromatography (SiO_2, *n*-pentane/Et_2O, 1:1). Yield: 573.5 mg (79%); R_f = 0.25 (*n*-pentane/Et_2O, 2:1); *ee* = 90% (based on the *de* value of the corresponding hydrazine). $[a]_D^{25}$ = +1.0 (*c* = 1.15, $CHCl_3$); m.p. 54 °C. ^{1}H NMR (400 MHz, $CDCl_3$): δ = 0.88 (t, *J* = 6.9 Hz, 3 H, C*H*$_3$), 1.23–2.15 [m, 22 H, CHC*H*$_2$, (C*H*$_2$)$_5$CH$_3$, (C*H*$_2$)$_{cyclo}$], 3.14 (t, *J* = 8.2 Hz, 2 H, SC*H*$_2$), 3.64 (m, 1 H, C*H*), 4.67 (m, 1 H, OC*H*), 4.81 (br. d, *J* = 9.1 Hz, 1 H, N*H*), 5.08 (s, 2 H, OC*H*$_2$), 7.34 (m, 5 H, Ph*H*) ppm. ^{13}C NMR (75 MHz, $CDCl_3$): δ = 14.0 (*C*H$_3$), 22.5 (*C*H$_2$CH$_3$), 23.5, 24.9, 32.7 [(*C*H$_2$)$_{cyclo}$], 29.6 (CH*C*H$_2$), 25.8, 29.0, 31.7, 35.5 [(C*H*$_2$)$_4$CH$_2$CH$_3$], 48.7 (S*C*H$_2$), 50.3 (*C*H), 66.8 (*C*H$_2$Ph), 81.2 (O*C*H), 128.0, 128.2, 128.6 (*C*Ph), 136.5 (*ipso*-*C*Ph), 156.3 (*C*=O) ppm. IR (KBr): $\tilde{\nu}$ = 3527 (w), 3471 (w), 3347 (s), 3064 (m), 3033 (m), 2933 (vs), 2860 (s), 2796 (w), 2759 (w), 2724 (w), 2697 (w), 1690 (vs), 1527 (vs), 1455 (s), 1344 (vs), 1283 (w), 1241 (s), 1197 (w), 1166 (vs), 1112

(m), 1057 (m), 1038 (s), 1002 (w), 930 (vs), 867 (s), 831 (s), 803 (w), 777 (m), 752 (m), 699 (s), 652 (m), 599 (s), 572 (m), 523 (m), 492 (m) cm^{-1}. MS (EI, 70 eV): *m/z* (%) = 439 (1) [M^+], 358 (5), 357 (18), 272 (15), 248 (10), 228 (23), 222 (11), 204 (18), 146 (5), 108 (50), 107 (10), 92 (9), 91 (100), 83 (5), 55 (8). MS (CI): *m/z* (%) = 440 (7), 386 (9), 360 (8), 359 (24), 358 (100), 357 (11), 356 (7), 342 (11), 340 (12), 315 (9), 314 (38), 250 (6), 108 (6), 91 (26). $C_{23}H_{37}NO_5S$ (439.61): calcd. C 62.84, H 8.48, N 3.19; found C 62.73, H 8.15, N 3.22.

Cyclohexyl (*S*)-(–)-3-Benzyloxycarbonylamino-3-(phenyl)propanesulfonate [(*S*)-5e]: Prepared as described in GP 4; N–N bond cleavage of hydrazine (*S*,*S*)-**4e** (0.218 g, 0.53 mmol) with BH_3·THF (6.4 mL, 12 equiv.) afforded the crude amine, which was directly converted into the carbamic acid benzyl ester (*S*)-**5e** by treatment with K_2CO_3 (0.388 g, 2.81 mmol) and CbzCl (0.39 mL, 2.76 mmol). (*S*)-**5e** was obtained as a colourless solid after flash column chromatography (SiO_2, *n*-pentane/Et_2O, 1:1). Yield: 0.213 g (96%); R_f = 0.51 (*n*-pentane/Et_2O, 1:1); *ee* ≥ 96% (based on the *de* value of the corresponding hydrazine). $[\alpha]_D^{25}$ = –17.4 (*c* = 1.03, $CHCl_3$); m.p. 114 °C. ^{1}H NMR (300 MHz, $CDCl_3$): δ = 1.26–2.00 [m, 10 H, $(CH_2)_{cyclo}$], 2.34 (m, 2 H, $CHCH_2$), 3.08 (m, 2 H, SCH_2), 4.67 [m, 1 H, $CH(CH_2)_{cyclo}$], 4.79 (m, 1 H, OC*H*), 5.08 (d, *J* = 6.2 Hz, 2 H, OCH_2), 5.21 (d, *J* = 8.4 Hz, 1 H, NH), 7.26–7.40 (m, 10 H, Ph*H*) ppm. ^{13}C NMR(75 MHz, $CDCl_3$): δ = 23.5, 24.8, 32.7 [$(CH_2)_{cyclo}$], 30.5 ($CHCH_2$), 48.7 (SCH_2), 54.1 (*C*H), 67.1 (CH_2Ph), 81.4 (O*C*H), 126.3, 128.2, 128.2, 128.6, 129.1 (*C*Ph), 136.1, 140.4 (*ipso*-*C*Ph), 155.7 (*C*=O) ppm. IR (KBr): $\tilde{\nu}$ = 3366 (s, br.), 3088 (w), 3062 (w), 3034 (m), 2993 (m), 2937 (s), 2863 (m), 1693 (vs), 1519 (vs), 1453 (m), 1417 (w), 1360 (vs), 1341 (vs), 1290 (m), 1253 (vs), 1236 (vs), 1163 (vs), 1045 (s), 937 (vs), 876 (s), 829 (m), 801 (w), 759 (s), 700 (s), 629 (w), 585 (m), 561 (m), 532 (s), 489 (w) cm^{-1}. MS (EI, 70 eV): *m/z* (%) = 349 (8), 258 (8), 241 (7), 240 (39), 215 (5), 213 (45), 200 (5), 197 (9), 196 (33), 132 (19), 116 (9), 108 (13),107 (13), 92 (8), 91 (100), 55 (7). $C_{23}H_{29}NO_5S$ (431.54): calcd. C 64.02, H 6.77, N 3.25; found C 64.17, H 6.55, N 3.09.

Cyclohexyl (*R*)-(–)-4-(Benzyloxycarbonylamino)pentanesulfonate [(*R*)-5f]: Prepared as described in GP 4; N–N bond cleavage of the hydrazine (*R*,*S*)-**4f** (196 mg, 0.56 mmol) with BH_3·THF (6.4 mL, 12 equiv.) afforded the crude amine, which was directly converted into the carbamic acid benzyl ester (*R*)-**5f** by treatment with K_2CO_3 (409.1 mg, 2.96 mmol) and CbzCl (0.41 mL, 2.91 mmol). Compound (*R*)-**5f** was obtained as a colourless solid after flash column chromatography (SiO_2, *n*-pentane/Et_2O, 2:1). Yield: 122 mg (58%); *ee* ≥ 96% (based on the *de* value of the corresponding hydrazine); R_f = 0.14 (*n*-pentane/Et_2O, 2:1). $[\alpha]_D^{25}$ = –5.8 (*c* = 0.99 in $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 1.15 (d, *J* = 6.6 Hz, 3 H, CH_3), 1.25–1.98 [m, 14 H, $(CH_2)_{cyclo}$, $SO_2CH_2CH_2CH_2$], 3.10 (m, 2 H, SO_2CH_2), 3.74 (m, 1 H, NHC*H*), 4.67 (m, 1 H, OC*H*), 4.81 (d, *J* = 8.2 Hz, 1 H, N*H*), 5.08 (s, 2 H, OCH_2), 7.28–7.36 (m, 5 H, Ph*H*) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 20.3 ($SO_2CH_2CH_2$), 21.1 (CH_3), 23.4, 24.8, 32.7 [$(CH_2)_{cyclo}$], 35.2 (CH_3CHCH_2), 46.3 (NH*C*H), 51.0 (SO_2CH_2), 66.4 (OCH_2), 80.9 (O*C*H), 127.8, 127.9, 128.3 (*C*Ph), 136.3 (*ipso*-*C*Ph), 155.6 (*C*=O) ppm. IR ($CHCl_3$): $\tilde{\nu}$ = 3376 (s), 3066 (w), 3031 (m), 2940 (vs), 2863 (s), 2362 (m), 2335 (m), 1703 (vs), 1653 (m), 1528 (vs), 1455 (s), 1413 (w), 1343 (vs), 1244 (vs), 1165 (vs), 1070 (s), 1030 (m), 1006 (w), 933 (vs), 870 (s), 830 (m), 756 (vs), 700 (m), 668 (w), 589 (w), 532 (w) cm^{-1}. MS (EI, 70 eV): *m/z* (%) = 383 (1) [M^+], 301 (22), 178 (15), 166 (10), 134 (25), 108 (65), 107 (19), 92 (8), 91 (100), 83 (5), 55 (6). MS (CI): *m/z* (%) = 384 (13) [M^+ + 1], 330 (9), 304 (7), 303 (19), 302 (100), 301 (7), 286 (10), 284 (16), 259 (7), 258 (41), 119 (6), 108 (5), 91 (28). HRMS, $C_{19}H_{29}NO_5S$: calcd. 383.1766; found 383.1768.

Cyclohexyl (*R*)-(–)-4-(Benzyloxycarbonylamino)octanesulfonate [(*R*)-5g]: Prepared as described in GP 4; N–N bond cleavage of the hydrazine (*R*,*S*)-**4g** (380 mg, 0.94 mmol) with BH_3·THF (11.3 mL, 12 equiv.) afforded the crude amine, which was directly converted into the carbamic acid benzyl ester (*S*)-**5e** by treatment with K_2CO_3 (688.3 mg, 4.98 mmol) and CbzCl (0.70 mL, 4.89 mmol). Compound (*R*)-**5g** was obtained as a colourless oil after flash column chromatography (SiO_2, *n*-pentane/Et_2O, 1:1). Yield: 211.2 mg (53%); *ee* = 93% (determined by HPLC chiral stationary phase); R_f = 0.21 (*n*-pentane/Et_2O, 2:1). $[\alpha]_D^{25}$ = –7.5 (*c* = 1.07, $CHCl_3$). ^{1}H NMR (300 MHz, $CDCl_3$): δ = 0.89 (t, *J* = 5.69 Hz, 3 H,CH_3), 1.24–2.00 [m, 20 H, $(CH_2)_{cyclo}$, $SO_2CH_2CH_2CH_2$, $CH_3CH_2CH_2CH_2$], 3.10 (m, 2 H, SO_2CH_2), 3.62 (m, 1 H, NHC*H*), 4.58 (d, *J* = 9.4 Hz, 1 H, N*H*), 4.68 (m, 1 H, OC*H*), 5.09 (s, 2 H, OCH_2), 7.26–7.37 (m, 5 H, Ph*H*) ppm. ^{13}C NMR (75 MHz, $CDCl_3$): δ = 14.0 (CH_3), 20.2 ($SO_2CH_2CH_2$), 22.5 (CH_3CH_2), 23.5, 24.9, 32.8 [$(CH_2)_{cyclo}$], 28.0 ($CH_3CH_2CH_2$), 33.8 ($CH_3CH_2CH_2CH_2$), 35.1 ($SOCH_2CH_2CH_2$), 50.6 (NH*C*H), 51.1 (SO_2CH_2), 66.6 (OCH_2), 81.0 (O*C*H), 128.0, 128.1, 128.5 (*C*Ph), 136.6 (*ipso*-*C*Ph), 156.2 (*C*=O) ppm. IR ($CHCl_3$): $\tilde{\nu}$ = 3336 (m), 3029 (m), 2938 (vs), 2862 (s), 1703 (vs), 1530 (vs), 1454 (s), 1414 (m), 1346 (vs), 1240 (s), 1166 (vs), 1109 (m), 1048 (w), 1005 (w), 934 (vs), 870 (s), 829 (m), 755 (vs), 699 (m), 593 (w), 530 (w) cm^{-1}. MS (EI, 70 eV): *m/z* (%) = 204 (38), 160 (26), 92 (7), 91 (100). MS (CI): *m/z* (%) = 426 (6) [M^+ + 1], 344 (11), 250 (22), 227 (6), 206 (13), 205 (6), 173 (10), 142 (14), 137 (5), 107 (6), 91 (45), 84 (7), 83 (100), 82 (18), 82 (70), 79 (10), 69 (20), 67 (12). HRMS, $C_{22}H_{35}NO_5S$: calcd. $C_{22}H_{35}NO_5S$ – $C_8H_{16}SO_2$ = 249.1365; found 249.1366.

Cyclohexyl (*R*)-(–)-4-(Benzyloxycarbonylamino)decanesulfonate [(*R*)-5h]: Prepared as described in GP 4; N–N bond cleavage of the hydrazine (*R*,*S*)-**4h** (696 mg, 1.61 mmol) with BH_3·THF (19 mL, 12 equiv.) afforded the crude amine, which was directly converted into the carbamic acid benzyl ester (*R*)-**5h** by treatment with K_2CO_3 (1.18 g, 8.53 mmol) and CbzCl (1.19 mL, 8.4 mmol). (*R*)-**5h** was obtained as a colourless oil after flash column chromatography (SiO_2, *n*-pentane/Et_2O, 1:1). Yield: 511 mg (70%); *ee* ≥ 96% (based on the *de* value of the corresponding hydrazine); R_f = 0.36 (*n*-pentane/Et_2O, 1:1). $[\alpha]_D^{25}$ = –1.6 (*c* = 0.98, $CHCl_3$). ^{1}H NMR (300 MHz, $CDCl_3$): δ = 0.88 (t, *J* = 7.0 Hz, 3 H, CH_3), 1.23–2.15 [m, 24 H, $SO_2CH_2CH_2CH_2$, $(CH_2)_5CH_3$, $(CH_2)_{cyclo}$], 3.10 (m, 2 H, SO_2CH_2), 3.63 (m, 1 H, C*H*), 4.55 (br. d, *J* = 9.2 Hz, 1 H, N*H*), 4.69 (m, 1 H, OC*H*), 5.09 (s, 2 H, OCH_2), 7.30–7.39 (m, 5 H, Ph*H*) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 14.0 (CH_3), 20.2 ($SO_2CH_2CH_2$), 22.5 (CH_2CH_3), 23.5, 24.8, 32.7 [$(CH_2)_{cyclo}$], 25.8 [$CH_2(CH_2)_3CH_3$], 29.1 [$CH_2(CH_2)_2CH_3$], 31.7 ($CH_2CH_2CH_3$), 33.8 ($SO_2CH_2CH_2CH_2$), 35.3 [$CH_2(CH_2)_4CH_3$], 50.6 (*C*H), 51.0 (SO_2CH_2), 66.6 (OCH_2), 81.0 (O*C*H), 127.8, 127.9, 128.3 (*C*Ph), 136.4 (*ipso*-*C*Ph), 156.0 (*C*=O) ppm. IR ($CHCl_3$): $\tilde{\nu}$ = 3364 (m), 3027 (m), 2935 (vs), 2860 (vs), 1706 (vs), 1528 (vs), 1454 (s), 1410 (w), 1345 (vs), 1236 (s), 1165 (vs), 1115 (m), 1057 (m), 1004 (w), 933 (vs), 871 (s), 829 (m), 757 (vs), 700 (m), 667 (w), 593 (w), 529 (w) cm^{-1}. MS (EI, 70 eV): *m/z* (%) = 372 (6), 371 (20), 287 (9), 286 (53), 248 (21), 243 (10), 242 (62), 236 (14), 225 (11), 205 (6), 204 (38), 108 (18), 107 (8), 92 (8), 91 (100), 83 (5), 67 (6). MS (CI): *m/z* (%) = 454 (6), 354 (9), 264 (17), 221 (10), 173 (8), 108 (22), 107 (14), 95 (8), 92 (9), 91 (74), 84 (5), 83 (70), 82 (69), 81 (100), 80 (13), 79 (31), 69 (18), 67 (61). HRMS, $C_{24}H_{39}NO_5S$: calcd. $C_{24}H_{39}NO_5S$ – C_6H_{10} = 371.1766; found 371.1765.

Cyclohexyl (*S*)-(–)-4-(Benzyloxycarbonylamino)-4-(phenyl)butanesulfonate [(*S*)-5i]: Prepared as described in GP 4; N–N bond cleavage of the hydrazine (*S*,*S*)-**4i** (1.13 g, 2.67 mmol) with BH_3·THF (32 mL, 12 equiv.) afforded the crude amine, which was directly converted into the carbamic acid benzyl ester (*S*)-**5i** by treatment

with K_2CO_3 (1.96 g, 14.25 mmol) and CbzCl (1.97 mL, 13.88 mmol). (*S*)-**5i** was obtained as a colourless oil after flash column chromatography (SiO_2, *n*-pentane/Et_2O, 1:1). Yield: 1.18 g (98%); *ee*: ≥ 96% (determined by HPLC on chiral stationary phase); R_f = 0.25 (*n*-pentane/Et_2O, 1:1). $[\alpha]_D^{25}$ = –15.9 (*c* = 1.00, $CHCl_3$). ^{1}H NMR (300 MHz, $CDCl_3$): δ = 1.18–1.89 [m, 14 H, $SO_2CH_2CH_2CH_2$, $(CH_2)_{cyclo}$], 3.06 (m, 2 H, SO_2CH_2), 4.64 (m, 2 H, NHC*H*, OC*H*), 5.06 (m, 2 H, OCH_2), 5.39 (br. s, 1 H, N*H*), 7.22–7.36 (m, 10 H, Ph*H*) ppm. ^{13}C NMR (75 MHz, $CDCl_3$): δ = 20.6 ($SO_2CH_2CH_2$), 23.4, 24.8, 32.7 [$(CH_2)_{cyclo}$], 34.8 ($SO_2CH_2CH_2CH_2$), 50.8 (SO_2CH_2), 54.8 (NH*C*H), 66.7 (OCH_2), 81.0 (O*C*H), 126.2, 127.5, 127.9, 128.3, 128.6 (*C*Ph), 136.3, 141.3 (*ipso*-*C*Ph), 155.6 (*C*=O) ppm. IR ($CHCl_3$): ṽ = 3336 (m), 3028 (m), 2942 (vs), 2863 (m), 1706 (vs), 1527 (s), 1454 (m), 1413 (w), 1344 (s), 1237 (m), 1167 (s), 1122 (w), 1053 (m), 1030 (m), 1004 (w), 932 (s), 870 (m), 831 (w), 756 (vs), 701 (s), 667 (w), 587 (w), 528 (m) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 568 (6), 512 (85), 327 (11), 326 (47), 325 (44), 318 (9), 241 (8), 240 (43), 228 (18), 213 (8), 212 (9), 211 (15), 197 (5), 196 (34), 151 (7), 150 (7), 147 (7), 132 (8), 131 (7), 130 (10), 129 (5), 120 (8), 108 (24), 107 (15), 106 (7), 105 (18), 104 (8), 92 (7), 91 (66), 83 (8), 82 (56), 81 (13), 79 (21), 78 (5), 77 (15), 68 (5), 67 (100), 65 (9), 56 (8), 54 (63), 54 (10), 52 (9), 51 (5). MS (CI): *m*/*z* (%) = 446 [M^+ + 1, 2], 225 (7), 214 (10), 213 (65), 152 (9), 131 (15), 108 (12), 107 (6), 105 (5), 95 (5), 92 (7), 91 (74), 84 (6), 83 (100), 82 (60), 81 (97), 80 (5), 79 (12), 69 (29), 67 (52). HRMS, $C_{24}H_{31}NO_5S$: calcd. 445.1922; found 445.1923.

General Procedure for the Synthesis of ω-Aminosulfonyl Chlorides (GP 5): The aminosulfonate **5** (1.0 equiv.) was dissolved in ethanol (30 mL/mmol) and water (1 mL/mmol) and refluxed for 18 h. After cooling to room temperature sodium acetate (1.1 equiv.) was added, and the solution was stirred for 1 h at room temperature. The solvent was removed and the obtained sodium sulfonate was directly converted into the corresponding sulfonyl chloride. Therefore, the residue was dissolved in abs. CH_2Cl_2 (10 mL/mmol) and abs. DMF (0.12 mL/mmol). Then a solution containing 20% phosgene in toluene (1.0 mL/mmol) was added, and the mixture was stirred for 2 h at room temperature. The solution was concentrated, and the crude product was purified by column chromatography (SiO_2, *n*-pentane/Et_2O).

(*R*)-(+)-3-(Benzyloxycarbonylamino)butane-1-sulfonyl Chloride [(*R*)-6a]: According to GP 5 compound (*R*)-**5a** (86.6 mg, 0.23 mmol) was dissolved in 6.9 mL ethanol and 0.23 mL water. After refluxing for 18 h, sodium acetate (21.5 mg, 0.26 mmol) was added, the resulting sodium sulfonate was dissolved in CH_2Cl_2 (2.3 mL abs.) and DMF (0.03 mL abs.) and converted with phosgene solution (0.23 mL, 20% in toluene) to the corresponding sulfonyl chloride (*R*)-**6a**, which could be isolated after column chromatography (SiO_2, *n*-pentane/Et_2O, 2:1) as a colourless solid. M.p. 82–84 °C; Yield: 50.3 mg (72%); R_f = 0.30 (*n*-pentane/Et_2O, 2:1); *ee* = 84% (based on the *ee* value of the corresponding sulfonate). $[\alpha]_D^{25}$ = +1.7 (*c* = 1.01, $CHCl_3$). ^{1}H NMR (300 MHz, $CDCl_3$): δ = 1.25 (d, *J* = 6.7 Hz, 3 H, CH_3), 2.08 (m, 1 H, C*H*HCH), 2.22 (m, 1 H, CH*H*CH), 3.70 (m, 2 H, SO_2CH_2), 3.90 (m, 1 H, C*H*), 4.70 (br. s, 1 H, N*H*), 5.10 (s, 2 H, OCH_2), 7.36 (m, 5 H, Ph*H*). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 21.4 (*C*H_3), 32.0 (CH*C*H_2), 45.7 (*C*H), 62.7 (S*C*H_2), 67.1 (*C*H_2Ph), 128.2, 128.4, 128.7 (*C*Ph), 136.1 (*ipso*-*C*Ph), 155.9 (*C*=O) ppm. IR (KBr): ṽ = 3307 (s, br.), 3070 (m), 2978 (w), 2792 (w), 1687 (vs), 1544 (vs), 1454 (m), 1376 (vs), 1293 (m), 1254 (vs), 1164 (vs), 1092 (s), 1059 (s), 1022 (m), 932 (m), 884 (w), 843 (w), 1022 (m), 932 (m), 884 (w), 843 (w), 762 (m), 730 (w), 699 (m), 593 (m), 530 (s), 487 (w) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 305 (3) [M^+], 109 (8), 108 (100), 107 (15), 92 (7), 91 (94), 79 (7), 65 (6). MS (CI): *m*/*z* (%) = 306 (4) [M^+ + 1], 302 (29), 284 (11), 259 (5), 258 (35), 206 (8), 119 (10), 108 (7), 92 (7), 91 (100). HRMS, $C_{12}H_{16}ClNO_4S$: calcd. 305.0489; found 305.0488.

(*R*)-(+)-3-(Benzyloxycarbonylamino)pentane-1-sulfonyl Chloride [(*R*)-6b]: According to GP 5 compound (*R*)-**5b** (223.8 mg, 0.58 mmol) was dissolved in ethanol (17.4 mL) and water (0.58 mL). After refluxing for 18 h, sodium acetate (53.0 mg, 0.65 mmol) was added, the resulting sodium sulfonate was dissolved in CH_2Cl_2 (5.8 mL abs.) and DMF (0.07 mL abs.) and converted with phosgene solution (0.58 mL, 20% in toluene) to the corresponding sulfonyl chloride (*R*)-**6b**, which could be isolated after column chromatography (SiO_2, *n*-pentane/Et_2O, 2:1) as a colourless solid. M.p. 71 °C; yield: 139 mg (74%); R_f = 0.51 (*n*-pentane/Et_2O, 1:1); *ee* = 82% (determined by HPLC chiral stationary phase). $[\alpha]_D^{25}$ = +3.0 (*c* = 0.61, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 0.97 (t, *J* = 7.4 Hz, 3 H, CH_3), 1.56 (m, 2 H, CH_2CH$_3$), 2.02 (m, 1 H, C*H*HCH), 2.27 (m, 1 H, CH*H*CH), 3.74 (m, 3 H, SCH_2, C*H*), 4.62 (d, *J* = 8.8 Hz, 1 H, N*H*), 5.10 (s, 2 H, OCH_2), 7.36 (m, 5 H, Ph*H*) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 10.3 (*C*H_3), 28.4, 30.1 (*C*H_2CH*C*H_2), 51.2 (*C*H), 62.7 (S*C*H_2), 67.0 (O*C*H_2), 128.0, 128.2, 128.5 (*C*Ph), 135.9 (*ipso*-*C*Ph), 156.1 (C=O) ppm. IR (KBr): ṽ = 3346 (vs), 3068 (w), 3036 (w), 2965 (s), 2929 (s), 2858 (m), 1687 (vs), 1529 (vs), 1454 (s), 1369 (vs), 1297 (s), 1243 (vs), 1165 (vs), 1090 (s), 1067 (m), 1038 (m), 996 (m), 932 (m), 841 (w), 777 (m), 752 (s), 724 (m), 695 (m), 659 (w), 608 (s), 527 (vs), 496 (s), 461 (w) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 319 (2) [M^+], 148 (5), 109 (6), 108 (74), 107 (7), 92 (8), 91 (100), 65 (5). MS (CI): *m*/*z* (%) = 320 (10) [M^+ + 1], 276 (5), 220 (22), 181 (6), 119 (7), 108 (7), 92 (9), 91 (100). HRMS, $C_{13}H_{18}ClNO_4S$: calcd. 319.0645; found 319.0642.

(*R*)-(+)-3-(Benzyloxycarbonylamino)heptane-1-sulfonyl Chloride [(*R*)-6c]: According to GP 5 compound (*R*)-**5c** (99.5 mg, 0.24 mmol) was dissolved in ethanol (7.2 mL) and water (0.24 mL). After refluxing for 18 h, sodium acetate (22.4 mg, 0.27 mmol) was added, the resulting sodium sulfonate was dissolved in CH_2Cl_2 (2.4 mL abs.) and DMF (0.03 mL abs.) and converted with phosgene solution (0.24 mL, 20% in toluene) to the corresponding sulfonyl chloride (*R*)-**6c**, which could be isolated after column chromatography (SiO_2, *n*-pentane/Et_2O, 2:1) as a colourless solid. M.p. 89 °C; yield: 62.8 mg (75%); R_f = 0.60 (*n*-pentane/Et_2O, 1:1); *ee* = 87% (based on the *de* value of the corresponding hydrazine). $[\alpha]_D^{25}$ = +7.0 (*c* = 1.00, $CHCl_3$). ^{1}H NMR (300 MHz, $CDCl_3$): δ = 0.90 (m, 3 H, CH_3), 1.25–1.56 [m, 6 H, $(CH_2)_3CH_3$], 2.02 (m, 1 H, C*H*HCH), 2.25 (m, 1 H, CH*H*CH), 3.74 (m, 3 H, SCH_2, C*H*), 4.72 (br. s, 1 H, N*H*), 5.10 (s, 2 H, OCH_2), 7.33–7.40 (m, 5 H, Ph*H*) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 13.9 (*C*H_3), 22.3 (*C*H_2CH$_3$), 27.9, 30.5, 35.1 [*C*H_2CH(*C*H_2)$_2$], 49.8 (*C*H), 62.6 (S*C*H_2), 67.0 (O*C*H_2), 127.9, 128.2, 128.4 (*C*Ph), 135.9 (*ipso*-*C*Ph), 156.0 (C=O) ppm. IR (KBr): ṽ = 3334 (vs), 3061 (w), 2950 (m), 2861 (m), 1692 (vs), 1539 (vs), 1454 (m), 1369 (vs), 1300 (s), 1249 (s), 1161 (s), 1109 (m), 1072 (w), 1032 (m), 937 (w), 908 (w), 777 (m), 748 (m), 729 (m), 696 (m), 672 (m), 557 (s), 538 (m), 487 (m) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 347 (2), 109 (5), 92 (8), 91 (100). MS (CI): *m*/*z* (%) = 350 (5), 348 (14), 304 (5), 249 (5), 248 (26), 119 (8), 108 (7), 92 (8), 91 (100), 65 (5). $C_{15}H_{22}ClNO_4S$ (347.85): calcd. C 51.79, H 6.37, N 4.03; found C 51.73, H 6.69, N 3.86.

(*R*)-(+)-3-(Benzyloxycarbonylamino)nonane-1-sulfonyl Chloride [(*R*)-6d]: According to GP 5 compound (*R*)-**5d** (141.3 mg, 0.32 mmol) was dissolved in ethanol (9.6 mL) and water (0.32 mL). After refluxing for 18 h, sodium acetate (29.7 mg, 0.36 mmol) was added, the resulting sodium sulfonate was dissolved in CH_2Cl_2 (3.2 mL abs.) and DMF (0.04 mL abs.) and converted with phosgene solution (0.32 mL, 20% in toluene) to the corresponding sul-

fonyl chloride (*R*)-**6d**, which could be isolated after column chromatography (SiO_2, *n*-pentane/Et_2O, 2:1) as a colourless solid. m.p. 85 °C; Yield: 100.0 mg (83%); R_f = 0.42 (*n*-pentane/Et_2O, 2:1); *ee* = 90% (based on the *de* value of the corresponding hydrazine). $[\alpha]_D^{25}$ = +5.8 (*c* = 1.03, $CHCl_3$). ^1H NMR (300 MHz, $CDCl_3$): δ = 0.88 (t, *J* = 6.4 Hz, 3 H, C*H*$_3$), 1.25–1.56 [m, 10 H, (C*H*$_2$)$_5$CH$_3$], 2.02 (m, 1 H, C*H*HCH), 2.26 (m, 1 H, CH*H*CH), 3.74 (m, 3 H, SC*H*$_2$, C*H*), 4.62 (d, *J* = 9.1 Hz, 1 H, N*H*), 5.10 (s, 2 H, OC*H*$_2$), 7.36 (m, 5 H, Ph*H*) ppm. ^{13}C NMR (75 MHz, $CDCl_3$): δ = 14.0 (*C*H$_3$), 22.5 (*C*H$_2$CH$_3$), 25.8, 28.9, 30.6, 31.6, 35.5 [*C*H$_2$CH(*C*H$_2$)$_4$], 49.9 (*C*H), 62.8 (S*C*H$_2$), 67.1 (O*C*H$_2$), 128.2, 128.4, 128.7 (*C*Ph), 136.1 (*ipso*-*C*Ph), 156.3 (C=O) ppm. IR (KBr): $\tilde{\nu}$ = 3695 (w), 3674 (w), 3653 (w), 3312 (vs, br.), 3066 (w), 2957 (s), 2927 (s), 2853 (m), 1689 (vs), 1541 (vs), 1451 (m), 1369 (vs), 1299 (m), 1262 (vs), 1165 (s), 1118 (w), 1064 (m), 1030 (m), 965 (w), 913 (w), 753 (m), 730 (m), 694 (m), 606 (w), 575 (m), 535 (s), 499 (m), 462 (w) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 375 (3) [M^+], 245 (7), 204 (10), 109 (6), 108 (76) 92 (9), 91 (100). MS (CI): *m*/*z* (%) = 375 (0.8) [M^+], 204 (7), 109 (5), 108 (62), 92 (8), 91 (100). $C_{17}H_{26}ClNO_4S$ (375.91): calcd. C 54.32, H 6.97, N 3.73; found C 54.66, H 6.77, N 3.25.

(*S*)-(–)-3-Benzyloxycarbonylamino-3-(phenyl)propane-1-sulfonyl Chloride [(*R*)-6e]: According to GP 5 compound (*R*)-**5e** (42.2 mg, 0.10 mmol) was dissolved in ethanol (3.0 mL) and water (0.10 mL). After refluxing for 18 h, sodium acetate (9.1 mg, 0.11 mmol) was added, the resulting sodium sulfonate was dissolved in CH_2Cl_2 (1.0 mL abs.) and DMF (0.01 mL abs.) and converted with phosgene solution (0.60 mL, 20% in toluene) to the corresponding sulfonyl chloride (*R*)-**6e**, which could be isolated after column chromatography (SiO_2, *n*-pentane/Et_2O, 1:1) as a colourless solid. m.p. 74 °C; Yield: 28 mg (80%); R_f = 0.43 (*n*-pentane/Et_2O, 1:1); *ee* ≥ 96% (based on the *de* value of the corresponding hydrazine). $[\alpha]_D^{25}$ = –23.1 (*c* = 0.62, $CHCl_3$). ^1H NMR (300 MHz, $CDCl_3$): δ = 2.54 (m, 2 H, C*H*$_2$CH), 3.69 (m, 2 H, SC*H*$_2$), 4.85 (m, 1 H, N*H*), 5.10–5.17 (m, 3 H, C*H*, OC*H*$_2$), 7.36 (m, 10 H, Ph*H*) ppm. ^{13}C NMR (75 MHz, $CDCl_3$): δ = 31.1 (*C*H$_2$CH), 53.7 (*C*H), 62.4 (S*C*H$_2$), 67.3 (O*C*H$_2$), 126.3, 128.2, 128.4, 128.6, 129.4 (*C*Ph), 135.9, 139.5 (*ipso*-*C*Ph), 155.8 (C=O) ppm. IR (KBr): $\tilde{\nu}$ = 3345 (vs), 3063 (m), 3032 (m), 2997 (m), 2939 (m), 1693 (vs), 1523 (vs), 1444 (m), 1372 (vs), 1290 (m), 1246 (vs), 1162 (vs), 1046 (s), 925 (m), 842 (m), 754 (s), 700 (s), 647 (w), 596 (m), 513 (s) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 376 (1), 276 (8), 240 (15), 232 (5), 196 (23), 132 (18), 117 (8), 108 (33), 107 (7), 92 (8), 91 (100), 65 (6). MS (CI): *m*/*z* (%) = 668 (2), 364 (14), 320 (8), 268 (14), 240 (9), 228 (6), 213 (30), 207 (19), 152 (28), 119 (14), 118 (7), 116 (60), 92 (8), 91 (100), 65 (5). $C_{17}H_{18}ClNO_4S$ (367.84): calcd. C 55.50, H 4.93, N 3.81; found C 55.37, H 5.13, N 3.66.

(*R*)-(–)-4-(Benzyloxycarbonylamino)pentane-1-sulfonyl Chloride [(*R*)-6f]: According to GP 5 compound (*R*)-**5f** (77.6 mg, 0.20 mmol) was dissolved in ethanol (6.0 mL) and water (0.20 mL). After refluxing for 18 h, sodium acetate (17.8 mg, 0.22 mmol) was added, the resulting sodium sulfonate was dissolved in CH_2Cl_2 (2.0 mL abs.) and DMF (0.02 mL abs.) and converted with phosgene solution (0.20 mL, 20% in toluene) to the corresponding sulfonyl chloride (*R*)-**6f**, which was isolated after column chromatography (SiO_2, *n*-pentane/Et_2O, 2:1) as a colourless solid. M.p. 88 °C; yield: 54.3 mg (84%); R_f = 0.09 (*n*-pentane/Et_2O, 2:1); *ee* ≥ 96% (based on the *de* value of the corresponding hydrazine). $[\alpha]_D^{25}$ = –7.8 (*c* = 0.65, $CHCl_3$). ^1H NMR (300 MHz, $CDCl_3$): δ = 1.23 (d, *J* = 6.7 Hz, 3 H,C*H*$_3$), 1.63 (m, 2 H, SO$_2$CH$_2$C*H*$_2$), 2.09 (m, 2 H, HNCHC*H*$_2$), 3.70 (m, 3 H, CH$_3$C*H*, SO$_2$C*H*$_2$), 4.65 (d, *J* = 6.7 Hz, 1 H, N*H*), 5.09 (s, 2 H, OC*H*$_2$), 7.33–7.37 (m, 5 H, Ph*H*) ppm. ^{13}C NMR (75 MHz, $CDCl_3$): δ = 21.1 (*C*H$_3$), 21.2 (SO$_2$CH$_2$CH$_2$*C*H$_2$), 34.8 (SO$_2$CH$_2$*C*H$_2$), 46.2 (NH*C*H), 65.0 (SO$_2$*C*H$_2$), 66.8 (O*C*H$_2$), 128.1, 128.2, 128.6 (*C*Ph), 136.4 (*ipso*-*C*Ph), 155.9 (*C*=O) ppm. IR (KBr): $\tilde{\nu}$ = 3312 (vs), 3044 (w), 2976 (m), 2952 (m), 2913 (m), 1685 (vs), 1537 (vs), 1459 (m), 1371 (vs), 1298 (m), 1252 (vs), 1165 (vs), 1098 (m), 1063 (s), 981 (w), 931 (m), 843 (w), 822 (w), 732 (s), 732 (s), 701 (m), 652 (m), 579 (w), 539 (s), 512 (s) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 319 (3), 134 (14), 109 (6), 108 (72), 107 (6), 92 (7), 91 (100), 65 (5). MS (CI): *m*/*z* (%) = 320 (10) [M^+ + 1], 119 (8), 108 (6), 92 (7), 91 (100). HRMS, $C_{13}H_{18}ClNO_4S$: calcd. 319.0645; found 319.0645.

(*R*)-(–)-4-(Benzyloxycarbonylamino)octane-1-sulfonyl Chloride [(*R*)-6g]: According to GP 5 compound (*R*)-**5g** (128.0 mg, 0.30 mmol) was dissolved in ethanol (9.0 mL) and water (0.30 mL). After refluxing for 18 h, sodium acetate (26.8 mg, 0.33 mmol) was added, the resulting sodium sulfonate was dissolved in CH_2Cl_2 (3.0 mL abs.) and DMF (0.04 mL abs.) and converted with phosgene solution (0.30 mL, 20% in toluene) to the corresponding sulfonyl chloride (*R*)-**6g**, which could be isolated after column chromatography (SiO_2, *n*-pentane/Et_2O, 2:1) as a colourless solid. M.p. 69 °C; yield: 97.5 mg (89%), R_f = 0.20 (*n*-pentane/Et_2O, 2:1); *ee* = 93% (based on the *ee* value of the corresponding sulfonate). $[\alpha]_D^{25}$ = –8.1 (*c* = 0.57, $CHCl_3$). ^1H NMR (300 MHz, $CDCl_3$): δ = 0.90 (br. s, 3 H, C*H*$_3$), 1.25–1.82 (m, 8 H, SO$_2$CH$_2$CH$_2$C*H*$_2$, CH$_3$C*H*$_2$C*H*$_2$C*H*$_2$), 2.09 (m, 2 H, SO$_2$CH$_2$C*H*$_2$), 3.60–3.85 (m, 3 H, SO$_2$C*H*$_2$, C*H*), 4.58 (d, *J* = 8.9 Hz, 1 H, N*H*), 5.11 (s, 2 H, OC*H*$_2$), 7.30–7.38 (m, 5 H, Ph*H*) ppm. ^{13}C NMR (75 MHz, $CDCl_3$): δ = 14.0 (*C*H$_3$), 21.0 (SO$_2$CH$_2$*C*H$_2$), 22.5 (CH$_3$*C*H$_2$), 28.0 (CH$_3$CH$_2$*C*H$_2$), 33.4 (CH$_3$CH$_2$CH$_2$*C*H$_2$), 35.2 (SO$_2$CH$_2$CH$_2$*C*H$_2$), 50.3 (NH*C*H), 65.0 (SO$_2$*C*H$_2$), 66.8 (O*C*H$_2$), 128.1, 128.3, 128.6 (*C*Ph), 136.4 (*ipso*-*C*Ph), 156.3 (*C*=O) ppm. IR (KBr): $\tilde{\nu}$ = 3319 (s), 3065 (w), 3033 (w), 3942 (s), 2857 (m), 1695 (vs), 1545 (vs), 1459 (m), 1413 (w), 1357 (s), 1248 (s), 1163 (s), 1111 (m), 1081 (w), 1054 (w), 1021 (m), 911 (w), 843 (w), 757 (s), 734 (s), 694 (m), 523 (s), 486 (w) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 361 (2) [M^+], 262 (5), 260 (16), 176 (18), 108 (30), 92 (8), 91 (100). MS (CI): *m*/*z* (%) = 362 (7) [M^+ + 1], 358 (18), 314 (6), 251 (16), 250 (100), 248 (7), 207 (9), 206 (45), 204 (17), 186 (6), 142 (24), 119 (14), 114 (9), 107 (5), 92 (7), 91 (94), 83 (5), 79 (9), 65 (6). $C_{16}H_{24}ClNO_4S$ (361.88): calcd. C 53.10, H 6.68, N 3.87; found C 53.45, H 6.82, N 4.14.

(*R*)-(–)-4-(Benzyloxycarbonylamino)decane-1-sulfonyl Chloride [(*R*)-6h]: According to GP 5 compound (*R*)-**5h** (58.8 mg, 0.13 mmol) was dissolved in ethanol (3.9 mL) and water (0.13 mL). After refluxing for 18 h, sodium acetate (11.8 mg, 0.14 mmol) was added, the resulting sodium sulfonate was dissolved in CH_2Cl_2 (1.3 mL abs.) and DMF (0.02 mL abs.) and converted with phosgene solution (0.80 mL, 20% in toluene) to the corresponding sulfonyl chloride (*R*)-**6h**, which could be isolated after column chromatography (SiO_2, *n*-pentane/Et_2O, 1:1) as a colourless solid. m.p. 51 °C; Yield: 38.9 mg (77%); R_f = 0.4 (*n*-pentane/Et_2O, 1:1); *ee* = 93% (based on the *ee* value of the corresponding sultam). $[\alpha]_D^{25}$ = –3.7 (*c* = 1.02, $CHCl_3$). ^1H NMR (300 MHz, $CDCl_3$): δ = 0.88 (t, 3 H, *J* = 6.9 Hz, C*H*$_3$), 1.25–1.80 [m, 12 H, (C*H*$_2$)$_5$CH$_3$, SO$_2$CH$_2$CH$_2$C*H*$_2$], 2.09 (m, 2 H, SO$_2$CH$_2$C*H*$_2$), 3.68 (m, 2 H, SO$_2$C*H*$_2$), 3.80 (m, 1 H, C*H*NH), 4.51 (d, 1 H, *J* = 8.5 Hz, N*H*), 5.10 (s, 2 H, OC*H*$_2$), 7.36 (m, 5 H, Ph*H*) ppm. ^{13}C NMR (75 MHz, $CDCl_3$): δ = 14.1 (*C*H$_3$), 21.0 (SO$_2$CH$_2$CH$_2$*C*H$_2$), 22.5 (*C*H$_2$CH$_3$), 25.8 (*C*H$_2$CH$_2$CH$_2$CH$_2$CH$_3$), 29.1 (*C*H$_2$CH$_2$, CH$_2$CH$_3$), 31.7 (*C*H$_2$CH$_2$CH$_3$), 33.7 (SO$_2$CH$_2$*C*H$_2$), 35.4 (*C*H$_2$CH$_2$CH$_2$CH$_2$CH$_2$CH$_3$), 50.3 (NH*C*H), 65.0 (SO$_2$*C*H$_2$), 66.8 (O*C*H$_2$), 128.1, 128.2, 128.6 (*C*Ph), 136.5 (*ipso*-*C*Ph), 156.3 (*C*=O) ppm. IR (KBr): $\tilde{\nu}$ = 3331 (s), 2930 (vs), 2858 (s), 2361 (m), 2342 (m), 1776 (m), 1691 (vs), 1538 (vs), 1457 (s), 1362 (vs), 1249 (vs), 1164 (vs), 1118 (m), 1065 (m), 741 (s), 696 (m), 575 (m), 525 (s) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 389 (4), 304 (8), 262 (10), 261 (5), 260 (27), 245 (8), 204 (23), 149 (5), 108 (36),

92 (9), 91 (100). MS (CI): *m/z* (%) = 480 (5), 420 (5), 419 (18), 418 (6), 417 (6), 416 (11), 392 (9), 391 (6), 390 (24), 359 (5), 331 (5), 329 (5), 328 (10), 327 (9), 326 (29), 325 (5), 313 (5), 293 (6), 291 (6), 290 (26), 248 (15), 246 (8), 240 (11), 204 (10), 196 (7), 152 (6), 119 (9), 108 (8), 92 (8), 91 (100), 65 (29). HRMS, $C_{18}H_{28}ClNO_4S$: calcd. 389.1428; found 389.1427.

(*S*)-(–)-4-Benzyloxycarbonylamino-4-(phenyl)butane-1-sulfonyl Chloride [(*S*)-6i]: According to GP 5 compound (*S*)-**5i** (903 mg, 2.0 mmol) was dissolved in ethanol (60.0 mL) and water (2.0 mL). After refluxing for 18 h, sodium acetate (185 mg, 2.25 mmol) was added, the resulting sodium sulfonate was dissolved in CH_2Cl_2 (20.0 mL abs.) and DMF (0.24 mL abs.) and converted with phosgene solution (12.18 mL, 20% in toluene) to the corresponding sulfonyl chloride (*S*)-**6i**, which could be isolated after column chromatography (SiO_2, *n*-pentane/Et_2O, 1:1) as a colourless solid. M.p. 88 °C; yield: 432 mg (56%); R_f = 0.30 (*n*-pentane/Et_2O, 1:1); *ee* ≥ 96% (based on the *de* value of the corresponding hydrazine). $[\alpha]_D^{25}$ = –26.6 (*c* = 0.98, $CHCl_3$). ^{1}H NMR (300 MHz, $CDCl_3$): δ = 2.0 (m, 4 H, $SO_2CH_2CH_2CH_2$), 3.67 (m, 2 H, SO_2CH_2), 4.73 (m, 1 H, NH), 5.10 (m, 3 H, CHNH, OCH_2), 7.28–7.40 (m, 10 H, PhH) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 21.3 ($SO_2CH_2CH_2CH_2$), 34.0 ($SO_2CH_2CH_2$), 54.5 (NHCH), 64.6 (SO_2CH_2), 66.8 (OCH_2), 126.1, 127.9, 128.0, 128.3, 128.8 (CPh), 136.0, 140.8 (*ipso*-CPh), 155.6 (C=O) ppm. IR (KBr): ṽ = 3346 (vs), 3032 (m), 2936 (s), 2876 (m), 1687 (vs), 1531 (vs), 1455 (m), 1412 (m), 1355 (vs), 1238 (s), 1166 (vs), 1127 (m), 1052 (s), 1024 (m), 947 (w), 911 (w), 838 (w), 752 (vs), 701 (s), 651 (m), 580 (w), 543 (s), 505 (s) cm^{-1}. MS (EI, 70 eV): *m/z* (%) = 319 (5), 274 (24), 249 (10), 248 (59), 240 (7), 230 (16), 205 (8), 204 (56), 196 (5), 92 (8), 91 (100), 71 (5). MS (CI): *m/z* (%) = 382 (8) [M^+ + 1], 359 (7), 321 (21), 320 (100), 319 (6), 318 (16), 313 (6), 290 (5), 288 (5), 285 (6), 277 (5), 276 (29), 274 (20), 250 (22), 249 (8), 248 (45), 240 (11), 231 (8), 230 (5), 213 (9), 212 (44), 206 (19), 204 (33), 184 (9), 160 (7), 154 (5), 152 (7), 142 (11), 131 (5), 119 (10), 114 (5), 92 (7), 91 (88), 83 (5), 71 (5), 65 (7). HRMS, $C_{18}H_{20}ClNO_4S$: calcd. $C_{18}H_{20}NO_4SCl - C_7H_7O$ 274.0305; found 274.1483.

General Procedure for the Synthesis of γ- and δ-Sultams (GP 6): The aminosulfonyl chlorides **6** were dissolved in CH_2Cl_2 (20 mL/mmol) and a 33% solution of HBr in AcOH (1.1 mL/mmol.) was added. After stirring for 3 h at room temperature the reaction mixture was cooled to 0 °C, and NEt_3 (12 mL/mmol) was added using a syringe pum.p. The solution was stirred for 2 h while it was warmed to room temperature. After the addition of water and separation of the organic layer the aqueous phases were extracted with CH_2Cl_2. The combined organic layers were dried with $MgSO_4$ and the solvent was removed under reduced pressure. The sultams were isolated after flash column chromatographic (SiO_2, *n*-pentane/Et_2O).

(*R*)-(+)-3-Ethyl-1,2-thiazolidine 1,1-Dioxide [(*R*)-7b]: According to GP 6 the compound (*R*)-**6b** (138 mg, 0.43 mmol) was cyclised to the sultam (*R*)-**7b** with HBr/AcOH (0.47 mL, 33%) and NEt_3 (5.16 mL). After flash column chromatography (SiO_2, *n*-pentane/Et_2O, 1:2) the product was obtained as a yellow oil. Yield: 45 mg (70%), R_t = 5.94 (Cp-Sil-8, 100–10–300); R_f = 0.16 (*n*-pentane/Et_2O, 1:2); *ee* = 78% (determined by GC on chiral stationary phase, Chiralsil-dex). $[\alpha]_D^{25}$ = +6.5 (*c* = 0.26, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 1.00 (t, *J* = 7.4 Hz, 3 H, CH_3), 1.65 (m, 2 H, CH_2CH_3), 2.09 (m, 1 H, SCH_2CHH), 2.52 (dddd, *J* = 4.1 Hz, *J* = 6.3 Hz, *J* = 8.0 Hz, *J* = 13.2 Hz, 1 H, SCH_2CHH), 3.11 (ddd, *J* = 8.2 Hz, *J* = 9.9 Hz, *J* = 12.9 Hz, 1 H, SCHH), 3.23 (ddd, *J* = 4.1 Hz, *J* = 8.8 Hz, *J* = 12.9 Hz,1 H, SCHH), 3.52 (m, 1 H, CH), 4.40 (br. s, 1 H, NH) ppm. ^{13}C NMR (75 MHz, $CDCl_3$): δ = 10.4 (CH_3), 28.9 (CH_2CH_3), 29.4 (SCH_2CH_2), 48.1 (SCH_2), 56.6 (CH) ppm. IR (film): ṽ = 3625 (w), 3562 (w), 3274 (s), 2967 (s), 2880 (m), 1460 (m), 1399 (m), 1299 (vs), 1186 (m), 1141 (vs), 1054 (w), 1020 (v), 976 (m), 925 (m), 847 (m), 740 (m), 667 (w), 595 (m), 482 (m) cm^{-1}. MS (EI, 70 eV): *m/z* (%) = 190 (2), 152 (5), 152 (5), 151 (11), 150 (100), 120 (9), 69 (13). MS (CI): *m/z* (%) = 150 (12), 122 (5), 121 (9), 120 (100), 57 (5), 56 (22). $C_5H_{11}NO_2S$ (149.21): calcd. C 40.25, H 7.43, N 9.39; found C 40.66, H 7.48, 9.30. The NMR spectroscopic data are in accordance with those reported in the literature.[13]

(*R*)-(+)-3-Butyl-1,2-thiazolidine 1,1-Dioxide [(*R*)-7c]: According to GP 6 the compound (*R*)-**6c** (62.8 mg, 0.18 mmol) was cyclised to the sultam (*R*)-**7c** with HBr/AcOH (0.20 mL, 33%) and NEt_3 (2.16 mL). After flash column chromatography (SiO_2, *n*-pentane/Et_2O, 1:2) the product was obtained as a yellow oil. Yield: 31.5 mg (99%); R_t = 8.36 min (CP-Sil-8, 100–10–300); R_f = 0.26 (*n*-pentane/Et_2O, 1:2); *ee* = 87% (based on the *de* value of the corresponding hydrazine). $[\alpha]_D^{25}$ = +7.4 (*c* = 0.76, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 0.92 (t, *J* = 6.9 Hz, 3 H, CH_3), 1.30–1.41 (m, 4 H, $CH_2CH_2CH_3$), 1.52–1.67 (m, 2 H, $CH_2CH_2CH_2CH_3$), 2.07 (m, 1 H, SCH_2CHH), 2.51 (dddd, *J* = 3.8 Hz, *J* = 6.3 Hz, *J* = 8.0 Hz, *J* = 13.2 Hz, 1 H, SCH_2CHH), 3.11 (ddd, *J* = 8.0 Hz, *J* = 9.9 Hz, *J* = 12.9 Hz, 1 H, SCHH), 3.22 (ddd, *J* = 3.8 Hz, *J* = 8.8 Hz, *J* = 12.9 Hz,1 H, SCHH), 3.58 (m, 1 H, CH), 4.24 (d, *J* = 5.5 Hz, 1 H, NH) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 13.9 (CH_3), 22.4 (CH_2CH_3), 28.2 ($CH_2CH_2CH_3$), 29.9 (SCH_2CH_2), 35.6 ($CH_2CH_2CH_2CH_3$), 48.0 (SCH_2), 55.2 (CH) ppm. IR ($CHCl_3$): ṽ = 3518 (w), 3265 (vs), 2932 (vs), 2865 (vs), 1726 (w), 1462 (m), 1399 (m), 1300 (vs), 1186 (s), 1079 (w), 1018 (w), 927 (m), 855 (w), 739 (m), 655 (w), 596 (m), 476 (m) cm^{-1}. MS (EI, 70 eV): *m/z* (%) = 178 (1) [M^+ + 1], 177 (1) [M^+], 122 (5), 120 (100), 56 (12). MS (CI): *m/z* (%) = 206 (5), 180 (5), 179 (9), 178 (100) [M^+ + 1], 120 (5). HRMS: $C_7H_{15}NO_2S$: calcd. 177.0824; found 177.0823, $C_7H_{15}NO_2S$ (177.26): calcd. C 47.43, H 8.53, N 7.90; found C 47.82, H 8.41, N 8.19.

(*R*)-(+)-3-Hexyl-1,2-thiazolidine 1,1-Dioxide [(*R*)-7d]: According to GP 6 the compound (*R*)-**6d** (54.6 mg, 0.15 mmol) was cyclised to the sultam (*R*)-**7d** using HBr/AcOH (0.16 mL, 33%) and NEt_3 (1.80 mL). After flash column chromatography (SiO_2, *n*-pentane/Et_2O, 1:2) the product was obtained as a colourless solid. M.p. 41 °C; yield: 28.5 mg (93%); R_f = 10.73 min (CP-Sil-8, 100–10–300); R_f = 0.32 (*n*-pentane/Et_2O, 1:2); *ee* = 90% (based on the *de* value of the corresponding hydrazine). $[\alpha]_D^{25}$ = +8.9 (*c* = 0.77, $CHCl_3$). ^{1}H NMR (300 MHz, $CDCl_3$): δ = 0.89 (t, *J* = 6.6 Hz, 3 H, CH_3), 1.20–1.42 [m, 8 H, $(CH_2)_4CH_3$], 1.60 [m, 2 H, $CH_2(CH_2)_4CH_3$], 2.07 (ddd, *J* = 8.9 Hz, *J* = 9.6 Hz, *J* = 13.3 Hz, 1 H, SCH_2CHH), 2.50 (ddd, *J* = 4.0 Hz, *J* = 7.9 Hz, *J* = 13.3 Hz, 1 H, SCH_2CHH), 3.10 (ddd, *J* = 8.0 Hz, *J* = 9.9 Hz, *J* = 12.9 Hz, 1 H, SCHH), 3.20 (ddd, *J* = 3.8 Hz, *J* = 8.5 Hz, *J* = 12.9 Hz, 1 H, SCHH), 3.58 (m, 1 H, CH), 4.21 (br. s, 1 H, NH) ppm. ^{13}C NMR (75 MHz, $CDCl_3$): δ = 14.0 (CH_3), 22.5 (CH_2CH_3), 26.1 [$CH_2(CH_2)_3CH_3$], 29.0 ($CH_2CH_2CH_2CH_3$), 29.9 (SCH_2CH_2), 31.6 ($CH_2CH_2CH_3$), 36.0 [$CH_2(CH_2)_4CH_3$], 48.1 (SCH_2), 55.3 (CH) ppm. IR (KBr): ṽ = 3920 (w), 3860 (w), 3754 (w), 3689 (w), 3655 (w), 3414 (m), 3315 (vs), 3030 (m), 2959 (vs), 2925 (vs), 2855 (s), 1742 (w), 1469 (m), 1429 (w), 1388 (s), 1347 (s), 1304 (m), 1279 (m), 1182 (s), 1143 (vs), 1078 (m), 1046 (w), 1007 (w), 956 (w), 920 (m), 860 (m), 828 (w), 793 (w), 735 (s), 635 (m), 584 (m), 477 (s) cm^{-1}. MS (EI, 70 eV): *m/z* (%) = 122 (5), 121 (5), 120 (100), 56 (10). MS (CI): *m/z* (%) = 207 (13), 206 [M^+ + 1, 100], 123 (5), 120 (20). HRMS, $C_9H_{19}NO_2S$: calcd. $C_9H_{19}NO_2S - C_6H_{13}$ 120.0119; found 120.0120.

(S)-(–)-3-Phenyl-1,2-thiazolidine 1,1-Dioxide [(*S*)-7e]: According to GP 6 the compound (*S*)-**6e** (95.6 mg, 0.26 mmol) was cyclised to the sultam (*S*)-**7e** with HBr/AcOH (0.28 mL, 33%) and NEt_3 (3.12 mL). After flash column chromatography (SiO_2, *n*-pentane/Et_2O, 1:2) the product was obtained as a colourless solid. M.p. 77 °C; yield: 39.7 mg (77%); R_f = 11.52 min (CP-Sil-8, 100–10–300); R_f = 0.19 (*n*-pentane/Et_2O, 1:2); *ee* = 93% (determined by GC on chiral stationary phase, Chiralsil-dex). $[\alpha]_D^{25}$ = –33.8 (*c* = 0.32, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 2.40 (m, 1 H, SCH_2CHH), 2.76 (m, 1 H, SCH_2CHH), 3.20 (ddd, *J* = 7.7 Hz, *J* = 10.5 Hz, *J* = 12.7 Hz, 1 H, $SCHH$), 3.34 (ddd, *J* = 3.9 Hz, *J* = 8.0 Hz, *J* = 12.7 Hz, 1 H, $SCHH$), 4.73 (m, 2 H, N*H*, C*H*), 7.30–7.42 (m, 5 H, Ph*H*) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 32.1 (SCH_2CH_2), 48.1 (SCH_2), 58.0 (*C*H), 125.8, 128.2, 128.8 (*C*Ph), 140.0 (*ipso*-*C*Ph) ppm. IR (KBr): $\tilde{\nu}$ = 3933 (s), 3878 (m), 3842 (m), 3821 (m), 384 (w), 3769 (w), 3751 (w), 3692 (m), 3654 (m), 3622 (m), 3593 (m), 3568 (m), 3479 (s), 3449 (vs), 3414 (s), 3384 (s), 3268 (vs), 3032 (m), 3001 (w), 2942 (s), 2864 (m), 2763 (w), 2698 (w), 1604 (w), 1495 (s), 1459 (s), 1372 (m), 1285 (vs), 1175 (s), 1137 (vs), 1045 (s), 1007 (s), 977 (w), 931 (vs), 840 (m), 804 (w), 760 (vs), 737 (s), 700 (vs), 613 (m), 588 (m), 523 (m) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 197 (14) [M^+], 169 (45), 106 (9), 105 (100), 104 (74), 78 (12), 77 (11), 51 (6). MS (CI): *m*/*z* (%) = 199 (14), 198 (100) [M^+ + 1], 120 (13), 117 (25), 105 (5). $C_9H_{11}NO_2S$ (197.25): calcd. C 54.80, H 5.62, N 7.10; found C 55.00, H 5.80, N 6.76. The NMR spectroscopic data are in accordance with those reported in the literature.[13]

(*R*)-(–)-3-Methyl-1,2-thiazinane 1,1-Dioxide [(*R*)-7f]: According to GP 6 the compound (*R*)-**6f** (54.3 mg, 0.17 mmol) was cyclised to the sultam (*R*)-**7f** with HBr/AcOH (0.18 mL, 33%) and NEt_3 (2.04 mL). After flash column chromatography (SiO_2, *n*-pentane/Et_2O, 1:1) the product was obtained as a colourless solid. M.p. 143 °C; yield: 20.8 mg (82%); R_f = 0.10 (*n*-pentane/Et_2O, 1:1); *ee* ≥ 96% (based on the *de* value of the corresponding hydrazine). $[\alpha]_D^{25}$ = –3.1 (*c* = 0.55, $CHCl_3$). ^{1}H NMR (300 MHz, $CDCl_3$): δ = 1.18–1.26 (m, 1 H, $SO_2CH_2CH_2CHH$), 1.23 (d, *J* = 6.4 Hz, 3 H, CH_3), 1.80 (dq, *J* = 14.1 Hz, *J* = 2.7 Hz, 1 H, NHCHC*H*H), 2.22 (m, 2 H, $CHCH_2CH_2$), 2.85 (m, 1 H, SO_2CHH), 3.18 (dt, *J* = 13.4 Hz, *J* = 3.7 Hz, 1 H, SO_2CHH), 3.60 (m, 1 H, NHC*H*), 4.03 (br. s, 1 H, N*H*) ppm. ^{13}C NMR (75 MHz, $CDCl_3$): δ = 21.5 (CH_3), 23.1 ($SO_2CH_2CH_2$), 32.1 ($SO_2CH_2CH_2CH_2$), 48.9 (SO_2CH_2), 52.5 (*C*H) ppm. IR (KBr): $\tilde{\nu}$ = 3976 (m), 3942 (m), 3896 (m), 3870 (m), 3828 (m), 3761 (m), 3685 (s), 3629 (m), 3593 (m), 3448 (vs), 3207 (vs), 3137 (m), 3100 (m), 3078 (m), 3048 (m), 2981 (s), 2938 (s), 3849 (s), 2797 (w), 2756 (w), 2709 (w), 2680 (w), 2646 (w), 2553 (w), 2527 (w), 2451 (w), 2214 (w) 2179 (w), 2122 (w), 2081 (w), 2025 (w), 1947 (w), 1847 (w), 1775 (w), 1707 (m), 1639 (s), 1500 (m), 1458 (s), 1433 (s), 1307 (vs), 1282 (vs), 1161 (vs), 1126 (vs), 1069 (s), 952 (vs), 887 (m), 857 (m), 779 (vs), 683 (m), 575 (s), 533 (s), 498 (s) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 149 (7) [M^+], 135 (10), 134 (100), 107 (5), 70 (12), 57 (14), 56 (7). MS (CI): *m*/*z* (%) = 152 (6), 151 (11), 150 (100) [M^+ + 1], 134 (5). HRMS, $C_5H_{11}NO_2S$: calcd. 149.0511; found 149.0508. The analytical data are in accordance with those reported in the literature.[10b]

(*R*)-(–)-3-Butyl-1,2-thiazinane 1,1-Dioxide [(*R*)-7g]: According to GP 6 the compound (*R*)-**6g** (40.9 mg, 0.11 mmol) was cyclised to the sultam (*R*)-**7g** with HBr/AcOH (0.12 mL, 33%) and NEt_3 (1.32 mL). After flash column chromatography (SiO_2, *n*-pentane/Et_2O, 1:1) the product was obtained as a colourless solid. M.p.86 °C; yield: 22.5 mg (100%), R_f = 0.14 (*n*-pentane/Et_2O, 1:1); R_t = 13.18 min (CP-Sil-8, 60–10–300); *ee* = 93% (determined by GC on chiral stationary phase, Chiralsil-dex). $[\alpha]_D^{25}$ = –20.6 (*c* = 0.65, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 0.90 (t, *J* = 7.1 Hz, 3 H, CH_3), 1.16–1.45 (m, 5 H, $SO_2CH_2CH_2CHH$, $CH_3CH_2CH_2$), 1.49 (m, 2 H, $CH_3CH_2CH_2CH_2$), 1.81 (dq, *J* = 14.0 Hz, *J* = 2.7 Hz, 1 H, $SO_2CH_2CH_2CHH$), 2.19 (m, 2 H, $SO_2CH_2CH_2$), 2.87 (m, 1 H, SO_2CHH), 3.19 (dt, *J* = 13.2 Hz, *J* = 3.6 Hz, 1 H,SO_2CHH), 3.44 (m, 1 H, NHC*H*), 4.06 (d, *J* = 9.3 Hz, 1 H,N*H*) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 13.9 (CH_3), 22.3 (CH_3CH_2), 22.9 ($SO_2CH_2CH_2$), 27.5 ($CH_3CH_2CH_2$), 30.3 ($SO_2CH_2CH_2CH_2$), 35.3 ($CH_3CH_2CH_2CH_2$), 49.2 (SO_2CH_2), 56.7 (*C*H) ppm. IR (KBr): $\tilde{\nu}$ = 3970 (w), 3945 (m), 3900 (w), 3880 (w), 3803 (m), 3777 (m), 3756 (m), 3737 (m), 3675 (m), 3631 (w), 3439 (vs), 3258 (vs), 3170 (w), 3132 (w), 3072 (w), 2942 (vs), 2869 (vs), 2770 (m), 2723 (w), 2703 (w), 2682 (w), 2648 (w), 2613 (w), 2560 (w), 2536 (w), 2457 (w), 2234 (w), 2198 (w), 2128 (w), 2095 (w), 2026 (w), 1704 (w), 1626 (s), 1499 (m), 1460 (s), 1415 (s), 1384 (m), 1310 (vs), 1242 (m), 1185 (s), 1144 (vs), 1067 (m), 1026 (m), 951 (vs), 882 (s), 764 (vs), 677 (s), 623 (m), 578 (m), 515 (s) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 191 (2) [M^+], 135 (9), 134 (100), 70 (6). MS (CI): *m*/*z* (%) = 193 (13), 192 (100) [M^+ + 1], 134 (7). $C_8H_{17}NO_2S$ (191.29): calcd. C 50.23, H 8.96, N 7.32; found C 50.11, H 9.27, N 7.23

(*R*)-(+)-3-Hexyl-1,2-thiazinane 1,1-Dioxide [(*R*)-7h]: According to GP 6 the compound (*R*)-**6h** (74.1 mg, 0.19 mmol) was cyclised to the sultam (*R*)-**7h** with HBr/AcOH (0.21 mL, 33%) and NEt_3 (2.28 mL). After flash column chromatography (SiO_2, *n*-pentane/Et_2O, 1:2) the product was obtained as a colourless solid. M.p. 75 °C; yield: 41.7 mg (100%); R_f = 0.34 (*n*-pentane/Et_2O, 1:2); R_t = 11.49 min (CP-Sil-8, 100–10–300); *ee* = 93% (determined by GC on chiral stationary phase, Chiralsil-dex). $[\alpha]_D^{25}$ = +14.8 (*c* = 0.52, $CHCl_3$). ^{1}H NMR (300 MHz, $CDCl_3$): δ = 0.89 (t, *J* = 7.0 Hz, 3 H, CH_3), 1.15–1.53 [m, 11 H, $SO_2CH_2CH_2CHH$, $CH_3(CH_2)_5$], 1.81 (dq, *J* = 14.1 Hz, *J* = 3.4 Hz, 1 H, $SO_2CH_2CH_2CHH$), 2.20 (m, 2 H, $SO_2CH_2CH_2$), 2.85 (m, 1 H, SO_2CHH), 3.20 (dt, *J* = 13.4 Hz, *J* = 3.7 Hz, 1 H, SO_2CHH), 3.45 (m, 1 H, C*H*), 3.99 (br. s, 1 H, N*H*) ppm. ^{13}C NMR (75 MHz, $CDCl_3$): δ = 14.0 (CH_3), 22.5 (CH_3CH_2), 23.1 ($SO_2CH_2CH_2$), 25.4 ($CH_3CH_2CH_2CH_2CH_2$), 29.0 ($CH_3CH_2CH_2CH_2$), 30.5 ($SO_2CH_2CH_2CH_2$), 31.6 ($CH_3CH_2CH_2$), 35.8 [$CH_3(CH_2)_4CH_2$], 49.4 (SO_2CH_2), 57.7 (*C*H) ppm. IR (KBr): $\tilde{\nu}$ = 3676 (m), 3630 (w), 3452 (s), 3258 (vs), 3204 (w), 3174 (w), 3135 (w), 3108 (w), 3074 (w), 3036 (w), 2923 (vs), 2853 (vs), 2371 (w), 2345 (w), 2312 (w), 1732 (m), 1627 (m), 1500 (w), 1460 (s), 1415 (m), 1382 (w), 1311 (vs), 1242 (m), 1184 (s), 1143 (vs), 1076 (m), 1028 (w), 1000 (w), 949 (s), 888 (m), 769 (vs), 678 (s), 582 (m), 520 (s), 463 (m) cm^{-1}. MS (EI, 70 eV): *m*/*z* (%) = 220 (3), 136 (5), 135 (9), 134 (100), 70 (8). MS (CI): *m*/*z* (%) = 248 (5), 222 (6), 221 (16), 220 (100), 218 (5), 134 (15). HRMS, $C_{10}H_{21}NO_2S$: calcd. 219.1293; found 219.1292.

(*S*)-(–)-3-Phenyl-1,2-thiazinane 1,1-Dioxide [(*S*)-7i]: According to GP 6 the compound (*S*)-**6i** (272.3 mg, 0.71 mmol) was cyclised to the sultam (*S*)-**7i** with HBr/AcOH (0.76 mL, 33%) and NEt_3 (8.52 mL). After flash column chromatography (SiO_2, *n*-pentane/Et_2O, 1:2) the product was obtained as a colourless solid. M.p. 149 °C; yield: 107.8 mg (72%); R_f = 0.28 (*n*-pentane/Et_2O, 1:2); R_t = 12.36 min (CP-Sil-8, 100–10–300); *ee* = 99% (determined by GC on chiral stationary phase, Chiralsil-dex). $[\alpha]_D^{25}$ = –16.5 (*c* = 0.91, $CHCl_3$). ^{1}H NMR (300 MHz, $CDCl_3$): δ = 1.73 (m, 1 H, $SO_2CH_2CH_2CHH$), 2.05 (m, 1 H, $SO_2CH_2CH_2CHH$), 2.33 (m, 2 H, $SO_2CH_2CH_2$), 3.01 (m, 1 H, SO_2CHH), 3.24 (dt, *J* = 13.4 Hz, *J* = 3.5 Hz, 1 H, SO_2CHH), 4.32 (br. s, 1 H, N*H*), 4.58 (ddd, *J* = 2.5 Hz, *J* = 6.9 Hz, *J* = 11.9 Hz, 1 H, C*H*), 7.02–7.16 (m, 5 H, Ph*H*) ppm. ^{13}C NMR (75 MHz, $CDCl_3$): δ = 23.3 ($SO_2CH_2CH_2$), 31.4 ($SO_2CH_2CH_2CH_2$), 49.1 (SO_2CH_2), 60.1 (NH*C*H), 126.4, 128.5, 129.0 (*C*Ph), 139.7 (*ipso*-*C*Ph) ppm. IR (KBr): $\tilde{\nu}$ = 3988 (w), 3953 (m), 3912 (m), 3860 (w), 3801 (s), 3697 (w), 3626 (s), 3595 (m), 3450 (vs), 3307 (m), 3259 (vs), 3161 (w), 3108 (m), 2946 (vs),

2853 (s), 2687 (w), 2633 (w), 2606 (w), 2534 (w), 2492 (w), 2426 (w), 2375 (w), 2344 (m), 2306 (w), 2270 (w), 1886 (m), 1832 (w), 1727 (w), 1600 (vs), 1501 (m), 1453 (s), 1428 (s), 1384 (w), 1335 (vs), 1286 (s), 1237 (m), 1142 (vs), 1029 (s), 939 (vs), 850 (m), 746 (vs), 696 (s), 557 (s), 516 (m), 464 (s) cm^{-1}. MS (EI, 70 eV): *m/z* (%) = 212 (10), 211 (19), 183 (6), 147 (37), 146 (63), 130 (5), 120 (9), 119 (100), 118 (73), 106 (9), 105 (54), 104 (99), 103 (5), 91 (11), 79 (6), 78 (17), 77 (23), 70 (16), 69 (10), 51 (11). MS (CI): *m/z* (%) = 214 (6), 213 (15), 212 (100), 195 (9), 147 (8), 146 (11), 134 (39), 131 (24), 119 (18), 118 (6), 105 (6), 104 (8). $C_{10}H_{13}NO_2S$ (211.28): calcd. C 56.89, H 6.20, N 6.63; found C 56.85, H 6.20, N 6.63.

X-ray Crystallographic Study: (*S*)-**7i** ($C_{10}H_{13}NO_2S$, M = 211.27). Suitable crystals were obtained by crystallisation from dichloromethane. The compound crystallises in the monoclinic space group $P2_1$ with cell dimensions a = 5.3012(9), b = 9.278(3), c = 10.3577(19) Å and β = 97.790(16)°. With Z = 2 and V = 504.73(19) $Å^3$ a calculated density of $d_{calcd.}$ = 1.390 g/cm^3 results. A single crystal (colourless block with dimensions $0.18 \times 0.20 \times 0.40$ mm) was measured with a Siemens Smart diffractometer at a temperature of about 161 K. Repeatedly measured reflections remained stable. Data collection covered the range $-7 \leq h \leq 8$, $-13 \leq k \leq 13$ and $-15 \leq l \leq 15$ up to θ_{max} = 32.6°. An empirical absorption correction with the program SADABS (Sheldrick, 2000) gave a correction factor between 0.938 and 1.000. Equivalent reflections were averaged. Friedel opposites were not averaged. $R(I)_{int}$ = 0.021. The structure was determined by direct methods using program SHELXS. 3246 unique reflections [$I > 2\sigma(I)$] were included in the full-matrix, least-square refinement on F^2 involving 179 parameters. Refinement with the program SHELXL-97 converged at $R(F)$ = 0.027 and $wR(F^2)$ = 0.067. The H atoms were taken from a difference synthesis and were refined with individual isotropic thermal parameters. The final difference density was between –0.29 and +0.35 e·$Å^3$. The absolute configuration of the molecule was confirmed by the value of the Flack *x*-parameter [x = 0.06(5)]. The saturated six-membered ring has a chair conformation. The phenyl group and the S–O(1) bond are in equatorial positions with respect to this six-membered ring. The S–O(2) and N–H bond are both in axial positions. The N atom has a pyramidal conformation, the sum of the three valence angles about N is 335°. The phenyl ring is approximately planar, the mean deviation of the C atoms from the benzene plane is 0.007 Å. The shortest intramolecular contact distance is 2.53 Å between H(6) and N. The N–C(4)–C(5)–C(6) torsion angle is –12.9(2)° and shows the phenyl ring to be almost coplanar with the C(4)–N bond. The molecules are connected by intermolecular N–H···O hydrogen bonds to chains parallel to the *a*-direction. Neighboring chains are connected by a weak intermolecular C–H···O and a very weak intermolecular C–H···π(phenyl) interaction.

CCDC-286031 [for (*S*)-**7i**] contains the supplementary crystallographic data for this paper. These data can be obtained free of charge from The Cambridge Crystallographic Data Centre via www.ccdc.cam.ac.uk/data_request/cif.

Acknowledgments

This work was supported by the Deutsche Forschungsgemeinschaft (Graduiertenkolleg 440, Sonderforschungsbereich 380) and the Fonds der Chemischen Industrie. We would like to thank Degussa AG, BASF AG and Bayer AG for donations of chemicals and Florian Pontzen for his skilful experimental contribution as an undergraduate student.

[1] a) S. Hanessian, H. Sailes, E. Therrien, *Tetrahedron* **2003**, *59*, 7047; b) L. Zhuang, J. S. Wai, M. W. Embrey, T. E. Fisher, M. S. Egbertson, L. S. Payne, J. P. Guare Jr, J. P. Vacca, D. J. Hazuda, P. J. Felock, A. L. Wolfe, K. A. Stillmock, M. V. Witmer, G. Moyer, W. A. Schleifer, L. J. Gabryelski, Y. M. Leonard, J. J. Lynch Jr, S. R. Michelson, S. D. Young, *J. Med. Chem.* **2003**, *46*, 453; c) M. Inagaki, T. Tsuri, H. Jyoyama, T. Ono, K. Yamada, M. Kobayashi, Y. Hori, A. Arimura, K. Yasui, K. Ohno, S. Kakudo, K. Koizumi, R. Suzuki, M. Kato, S. Kawai, S. Matsumoto, *J. Med. Chem.* **2000**, *43*, 2040; d) R. A. Miller, G. R. Humphrey, D. R. Lieberman, S. S. Ceglia, D. J. Kennedy, E. J. J. Grabowski, P. J. Reider, *J. Org. Chem.* **2000**, *65*, 1399.

[2] A. R. Katritzky, J. Wu, S. Rachwal, B. Rachwal, D. W. Macomber, T. P. Smith, *Org. Prep. Proced. Int.* **1992**, *24*, 463.

[3] a) G. J. Wells, M. Tao, K. A. Josef, R. Bihovski, *J. Med. Chem.* **2001**, *44*, 3488; b) G. J. Wells, M. Tao, K. A. Josef, R. Bihovski, *Drugs Future* **1998**, *23*, 365; c) G. J. Wells, M. Tao, K. A. Josef, R. Bihovski, *Drugs Future* **1992**, *17*, 451; d) H. Tanimukai, M. Inoui, S. Hariguchi, Z. Kaneko, *Biochem. Pharmacol.* **1965**, *14*, 961.

[4] O. Reiser, in: *Organic Synthesis Highlights IV* (Ed.: H.-G. Schmalz), Wiley-VCH: Weinheim, **2000**, 11.

[5] F. A. Davis, B.-C. Chen, *Chem. Rev.* **1992**, *92*, 919.

[6] a) W. Oppolzer, *Pure Appl. Chem.* **1990**, *62*, 1241; b) B. H. Kim, D. P. Curran, *Tetrahedron* **1993**, *49*, 293; c) W. Oppolzer, C. G. Bochet, E. Merifield, *Tetrahedron Lett.* **1994**, *35*, 7015.

[7] a) K. Villeneuve, W. Tam, *Angew. Chem.* **2004**, *116*, 620; *Angew. Chem. Int. Ed.* **2004**, *43*, 610; b) J. Raczko, M. Achmatowicz, P. Kwiatkowski, C. Chapuis, Z. Urbancyk-Lipkowska, J. Jurczak, *Tetrahedron: Asymmetry* **2000**, *11*, 1027; c) J. Lin, W. H. Chan, A. W. M. Lee, W. Y. Wong, *Tetrahedron* **1999**, *55*, 13983; d) A. W. M. Lee, W. H. Chan, W. H. Yuen, P. F. Xia, W. Y. Wong, *Tetrahedron: Asymmetry* **1999**, *10*, 1421; e) W. H. Chan, A. W. M. Lee, L. S. Jiang, T. C. W. Mak, *Tetrahedron: Asymmetry* **1997**, *8*, 2501; f) W. Oppolzer, J.-P. Barras, *Helv. Chim. Acta* **1987**, *70*, 1666; g) W. Oppolzer, R. J. Mills, M. Réglier, *Tetrahedron Lett.* **1986**, *27*, 183.

[8] a) M. Ueda, H. Miyabe, A. Nishimura, O. Miyata, Y. Takemoto, T. Naito, *Org. Lett.* **2003**, *5*, 3835; b) H. Togo, Y. Harada, M. Yokoyama, *J. Org. Chem.* **2000**, *65*, 926; c) M. Katohgi, H. Togo, K. Yamaguchi, M. Yokoyama, *Tetrahedron* **1999**, *55*, 14885; d) S. M. Leit, L. A. Paquette, *J. Org. Chem.* **1999**, *64*, 9225; e) L. A. Paquette, S. M. Leit, *J. Am. Chem. Soc.* **1999**, *121*, 8126; f) E. Bonfand, W. B. Motherwell, A. M. K. Pennell, M. K. Uddin, F. Ujjainwalla, *Heterocycles* **1997**, *46*, 523.

[9] a) J. Morris, D. G. Wishka, *J. Org. Chem.* **1991**, *56*, 3549; b) M. Kobayashi, M. Okahara, S. Komori, T. Agawa, *Synthesis* **1973**, 667.

[10] a) J.-L. Liang, S.-X. Yuan, J.-S. Huang, C.-M. Che, *J. Org. Chem.* **2004**, *69*, 3610; b) C. Fruit, P. Müller, *Helv. Chim. Acta* **2004**, *87*, 1607; c) J.-L. Liang, S.-X. Yuan, P. W. H. Chan, C.-M. Che, *Tetrahedron Lett.* **2003**, *44*, 5917; d) J.-L. Liang, S.-X. Yuan, P. W. H. Chan, C.-M. Che, *Org. Lett.* **2002**, *4*, 4507; e) P. Dauban, R. H. Dodd, *Tetrahedron Lett.* **2001**, *42*, 1037; f) P. Dauban, R. H. Dodd, *Org. Lett.* **2000**, *2*, 2327.

[11] a) H.-K. Zhang, W.-H. Chan, A. W. M. Lee, W.-Y. Wong, P.-F. Xia, *Tetrahedron: Asymmetry* **2005**, *16*, 761; b) H. Zhang, W. H. Chan, A. W. M. Lee, P.-F. Xia, W. Y. Wong, *Lett. Org. Chem.* **2004**, *1*, 63; c) H. Zhang, W. H. Chan, A. W. M. Lee, P.-F. Xia, W. Y. Wong, *Tetrahedron Lett.* **2003**, *44*, 395; d) U. Chiacchio, A. Corsaro, G. Gambera, A. Rescifina, A. Piperno, R. Romeo, G. Romeo, *Tetrahedron: Asymmetry* **2002**, *13*, 1915; e) U. Chiacchio, A. Corsaro, A. Rescifina, M. Bkaithan, G. Grassi, A. Piperno, T. Privitera, G. Romeo, *Tetrahedron* **2001**, *57*, 3425.

[12] S. Merten, R. Fröhlich, O. Kataeva, P. Metz, *Adv. Synth. Catal.* **2005**, *347*, 754.

[13] J. Lee, Y.-L. Zhong, R. A. Reamer, D. Askin, *Org. Lett.* **2003**, *5*, 4175.
[14] G. F. Cooper, *Synthesis* **1991**, 859.
[15] a) V. O. Rogatchov, H. Bernsmann, P. Schwab, R. Fröhlich, B. Wibbeling, P. Metz, *Tetrahedron Lett.* **2002**, *43*, 4753; b) I. R. Greig, M. J. Tozer, P. T. Wright, *Org. Lett.* **2001**, *3*, 369; c) K. F. Ho, D. C. W. Fung, W. Y. Wong, W. H. Chan, A. W. M. Lee, *Tetrahedron Lett.* **2001**, *42*, 3121; d) A. D. Brosius, L. E. Overman, L. Schwink, *J. Am. Chem. Soc.* **1999**, *121*, 700; e) P. Metz, D. Seng, R. Fröhlich, B. Wibbeling, *Synlett* **1996**, 741; f) Review: D. Craig, *Chem. Soc. Rev.* **1987**, *16*, 187.
[16] a) M. D. McReynolds, J. M. Dougherty, P. R. Hanson, *Chem. Rev.* **2004**, *104*, 2239; b) D. Freitag, P. Schwab, P. Metz, *Tetrahedron Lett.* **2004**, *45*, 3589; c) S. Karsch, D. Freitag, P. Schwab, P. Metz, *Synthesis* **2004**, 1696; d) A. J. Brouwer, R. M. J. Liskamp, *J. Org. Chem.* **2004**, *69*, 3662; e) D. D. Long, A. P. Termin, *Tetrahedron Lett.* **2000**, *41*, 6743; f) R. C. D. Brown, J. L. Castro, J.-D. Moriggi, *Tetrahedron Lett.* **2000**, *41*, 3681.
[17] P. R. Hanson, D. A. Probst, R. E. Robinson, M. Yau, *Tetrahedron Lett.* **1999**, *40*, 4761.
[18] J. Wanner, A. M. Harned, D. A. Probst, K. W. C. Poon, T. A. Klein, K. A. Snelgrove, P. R. Hanson, *Tetrahedron Lett.* **2002**, *43*, 917.
[19] B. Plietker, D. Seng, R. Fröhlich, P. Metz, *Tetrahedron* **2000**, *56*, 873.
[20] Recent examples: a) D. Enders, G. Del Signore, *Heterocycles* **2004**, *64*, 101; b) D. Enders, S. Wallert, *Synthesis* **2003**, 1856; c) D. Enders, W. Harnying, N. Vignola, *Eur. J. Org. Chem.* **2003**, 3939; d) D. Enders, S. Wallert, *Tetrahedron Lett.* **2002**, *43*, 5109.
[21] a) D. Enders, A. Moll, A. Schaadt, J. Runsink, G. Raabe, *Eur. J. Org. Chem.* **2003**, *20*, 3923; b) D. Enders, A. Moll, *Synthesis* **2005**, 1807.
[22] Reviews: a) D. Enders, M. Voith, A. Lenzen, *Angew. Chem.* **2005**, *117*, 1330; *Angew. Chem. Int. Ed.* **2005**, *44*, 1304; b) A. Job, C. F. Janeck, W. Bettray, R. Peters, D. Enders, *Tetrahedron* **2002**, *58*, 2253.
[23] D. Enders, H. Eichenauer, *Tetrahedron Lett.* **1977**, *18*, 191.
[24] a) T. Imamoto, Y. Sugiura, *J. Organomet. Chem.* **1985**, *285*, C21; b) T. Imamoto, N. Takiyama, K. Nakamura, *Tetrahedron Lett.* **1985**, *26*, 4763; c) T. Imamoto, Y. Sugiura, N. Takiyama, *Tetrahedron Lett.* **1984**, *25*, 4233; d) T. Imamoto, T. Kusumoto, Y. Tawarayama, Y. Sugiura, T. Mita, Y. Hatanakan, M. Yokoyama, *J. Org. Chem.* **1984**, *49*, 3904.
[25] a) D. Enders, K. Funabiki, *Org. Lett.* **2001**, *3*, 1575; b) R. Fernández, A. Ferrete, J. M. Lassaletta, J. M. Llera, A. Monge, *Angew. Chem.* **2000**, *112*, 3015; *Angew. Chem. Int. Ed.* **2000**, *39*, 2893; c) S. Kobayashi, R. J. Hirabayashi, *J. Am. Chem. Soc.* **1999**, *121*, 6942; d) D. Enders, R. Lochtman, M. Meiers, S. Müller, R. Lazny, *Synlett* **1998**, 1182; e) I. Meyer, *Dissertation*, RWTH Aachen **1998**; f) L. E. Overman, B. N. Rogers, J. E. Tellew, W. C. J. Trenkle, *J. Am. Chem. Soc.* **1997**, *119*, 7159; g) D. Enders, J. Wiedemann, *Liebigs Ann./Recl.* **1997**, 699; h) J. Y. Choi, Y. H. Kim, *Tetrahedron Lett.* **1996**, *37*, 7795; i) D. Enders, M. Meiers, *Angew. Chem.* **1996**, *108*, 2391; *Angew. Chem. Int. Ed. Engl.* **1996**, *35*, 2261; j) N. Yamazaki, H. Suzuki, S. Aoyagi, C. Kibayashi, *Tetrahedron Lett.* **1996**, *37*, 6161; k) Y. H. Kim, J. Y. Choi, *Tetrahedron Lett.* **1996**, *37*, 5543; l) Y. Leblanc, N. Boudreault, *J. Org. Chem.* **1995**, *60*, 4268; m) R. Beaudegnies, L. Ghosez, *Tetrahedron: Asymmetry* **1994**, *5*, 557; n) D. Enders, H. Kempen, *Synlett* **1994**, 969; o) S. E. Denmark, J. P. Edwards, O. Nicaise, *J. Org. Chem.* **1993**, *58*, 569; p) S. E. Denmark, O. Nicaise, J. P. Edwards, *J. Org. Chem.* **1990**, *55*, 6219; q) T. Weber, J. P. Edwards, S. E. Denmark, *Synlett* **1989**, 20; r) D. Enders, A. S. Demir, H. Puff, S. Franken, *Tetrahedron Lett.* **1987**, *28*, 3795; s) D. A. Claremon, P. K. Lumma, B. T. Philips, *J. Am. Chem. Soc.* **1986**, *108*, 8265; t) H. Takahashi, Y. Suzuki, *Chem. Pharm. Bull.* **1983**, *31*, 4995; u) H. Takahashi, K. Tomita, H. Noguchi, *Chem. Pharm. Bull.* **1981**, *29*, 3387; v) H. Feuer, F. Brown Jr, *J. Org. Chem.* **1970**, *35*, 1468; w) H. Wieland, H. Fressel, *Ber. Dtsch. Chem. Ges.* **1911**, *44*, 898.
[26] D. Enders, S. Wallert, *Synlett* **2002**, 304.
[27] D. Enders, G. Del Signore, *Tetrahedron: Asymmetry* **2004**, *15*, 747.
[28] Review: D. Enders, U. Reinhold, *Tetrahedron: Asymmetry* **1997**, *8*, 1895.

Received: November 3, 2005
Published Online: December 29, 2005

