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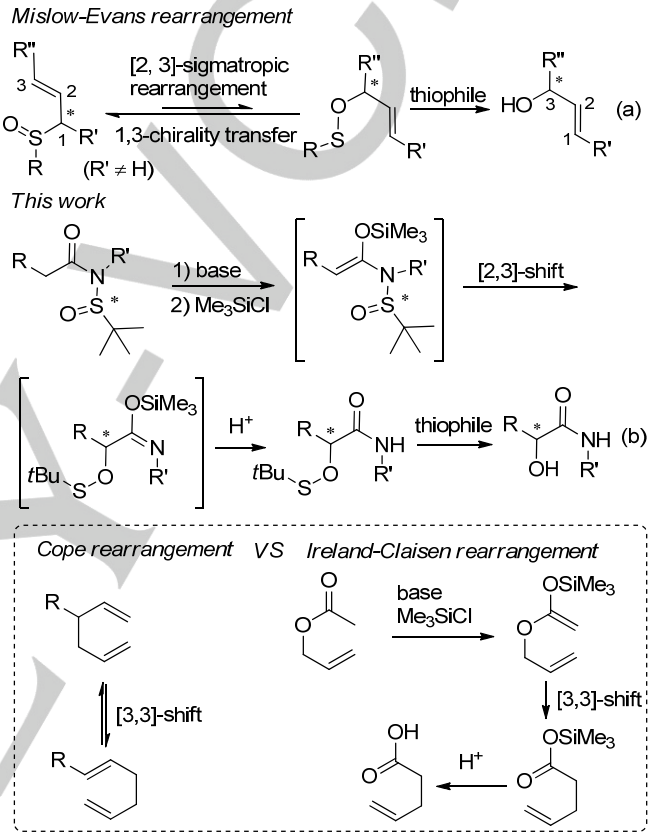
Diastereoselective Aza-Mislow-Evans Rearrangement of *N*-Acyl-*tert*-Butanesulfinamides into α-Sulfenyloxy Carboxamides

Fan Tang,[b], [c] Yun Yao,[a] Yan-Jun Xu,[b] and Chong-Dao Lu* [a], [b]

Abstract: A diastereoselective [2,3]-rearrangement of *O*-silyl *N*-sulfinyl *N*,*O*-ketene acetals derived from chiral *N*-acyl-*tert*-butanesulfinamides was developed, giving α-sulfenyloxyl carboxamides with excellent enantioselectivities. Enolization and subsequent silylation of *N*-acyl-*tert*-butanesulfinamides initiate the aza-variant of Mislow-Evans rearrangement, in which the chirality of the sulfur in the rearrangement precursors is faithfully transferred to the α-carbon stereocenter of the products. Ellman's sulfinamide, often used as a chiral ammonia equivalent, can serve in this rearrangement as a chiral precursor for the asymmetric synthesis of α-oxygen-functionalized carboxamides.

[2,3]-Sigmatropic rearrangement is a fundamental transformation in organic synthesis. Mislow-Evans rearrangement,[1] also known as Mislow−Braverman−Evans rearrangement,[2] is a reversible [2,3]-sigmatropic rearrangement involving conversion between an allylic sulfoxide and sulfenate ester, in which the reaction is generally shifted toward the sulfoxide. Sulfoxide−sulfenate rearrangement in the presence of a thiophile leads to S–O bond cleavage of the sulfenate ester, generating allylic alcohols (Scheme 1a). This process has been used to diastereoselectively construct allylic alcohol subunits in bioactive complex molecules such as (−)-doxycycline.[3] Recent studies of Mislow–Evans rearrangement have focused on incorporating the rearrangement into sequential transformations,[4] thereby expanding synthetic applications.[5] In addition, replacing the sulfoxide oxygen with a functionalized nitrogen atom has expanded the substrate scope to include allylic sulfimides.[6] However, relatively few sigmatropic rearrangement reactions involving sulfinamides have been reported,[7] in contrast to widespread use of rearrangements involving functionalized allylic sulfoxides.

Here we report an unprecedented [2,3]-rearrangement of *N*-acylsulfinamides. We envisioned that enolization and subsequent silylation of *N*-acyl sulfinamides[8] would afford *O*-silyl *N*-sulfinyl *N*,*O*-ketene acetal intermediates that could undergo [2,3]-rearrangement and provide α-sulfenyloxy carboxamides (Scheme 1b). This transformation can be viewed as an aza-variant of the Mislow-Evans rearrangement, and its path to ketene acetal formation is reminiscent of the well-known Ireland-Claisen rearrangement,[9] in which a silyl ketene acetal derived from an allylic ester undergoes an oxa-variant of the Cope [3,3]-rearrangement. In the aza-Mislow-Evans rearrangement proposed here, the chirality of the sulfur in the sulfinyl group is transferred to the α-position of the carboxamide products; subsequent cleavage of the S–O bond yields enantioenriched α-hydroxyl carboxamides (Scheme 1b). In this way, carboxamides are α-hydroxylated asymmetrically without the need for oxidant.[10] The chiral sulfinyl group in the rearrangement precursors serves as a potential hydroxyl group, and the sulfinyl group can be conveniently introduced into rearrangement precursors by using chiral sulfinamides as starting materials. Ellman's *tert*-butanesulfinamide,[11] commonly



Scheme 1. [2,3]-Rearrangement of *N*-Acyl-*tert*-Butanesulfinamides via *O*-Silyl *N*-Sulfinyl *N*,*O*-Ketene Acetal Intermediates.

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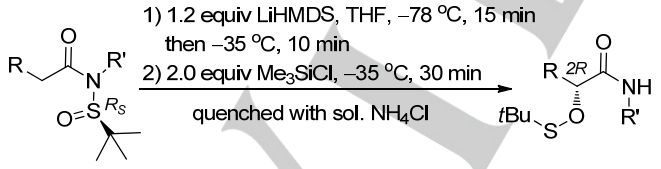
used as a chiral ammonia equivalent, was chosen for our experiments because of its low molecular weight and low cost, and because both enantiomers can easily be obtained on the kg scale. This facilitates economical installation of an α-sulfenyloxyl functional group in the *R* or *S* configuration.

We initially examined the feasibility of the rearrangement using *N*-allyl-*N*-acyl-(R_S)-sulfinamide **1a**. Deprotonation of 1a with lithium hexamethyldisilazide (LiHMDS) at −78 °C and subsequent silylation at −35 °C with chlorotrimethylsilane (TMSCl) led to the proposed rearrangement (Scheme 2). Workup with aqueous ammonium chloride afforded the rearrangement product α-sulfenyloxy carboxamide **2a** in 90% yield with an enantiomeric ratio of 97:3. For reproducible results, TMSCl had to be added to the reaction at −35 °C, and this temperature had to be maintained throughout the reaction. In contrast, when TMSCl was added to the reaction mixture at −78 °C and the reaction mixture was warmed quickly to room temperature, substantial byproducts sometimes formed. These byproducts may have arisen through competitive intermolecular nucleophilic addition of the lithiated enolate intermediate to the sulfinyl group of another *N*-acyl-sulfinamide before its silylation.[12] In the absence of silylation reagent, the reaction afforded no rearrangement product, even at room temperature. Replacing LiHMDS with NaHMDS or KHMDS resulted in low isolated yield and obvious byproduct formation. Swapping the allyl substitution on the nitrogen atom of **1a** to benzyl (Bn) or *para*-methoxyphenyl (PMP) did not interfere with intramolecular rearrangement, affording the corresponding products **2b** and **2c** in high yields and excellent enantiomeric ratios. The rearrangement precursor of *N*-phenylacetyl-sulfinamide **1d** also led to highly efficient transformation with 74% yield and an enantiomeric ratio of 99:1. Gram-scale preparation of **2d** gave good yield of 80% while slightly decreasing enantioselectivity (~97:3 er). The structures of **2a**-**d** were confirmed using single-crystal x-ray diffraction analysis.[13] The absolute configuration of **2a** and **2b** was assigned as (*2R*) based on x-ray crystallography,[14] and that of **2d** was also assigned as (*2R*) based on comparison between the optical rotation of the S–O bond cleavage product of **2d** and the optical rotation of the synthetic α-hydroxyl amide sample prepared from (*R*)-mandelic acid.



1a (R = Me, R' = allyl)
1b (R = Me, R' = Bn)
1c (R = Me, R' = PMP)
1d (R = Ph, R' = PMP)
(*PMP = 4-MeOC$_6$H$_4$*)

2a (90% yield, 97:3 er)
2b (88% yield, 97.5:2.5 er)
2c (96% yield, 99:1 er)
2d (74% yield, 99:1 er)

Scheme 2. Initial Results of Chiral *N*-Acyl-*tert*-Butanesulfinamide Rearrangement via *O*-Silyl *N*-Sulfinyl *N*,*O*-Ketene Acetal Intermediates.

Table 1. Substrate Scope[a]

Entry	*N*-Acyl-*tert*-butanesulfinamides (R, R')	Product	Yield (%)[b]	Enantiomeric ratio[c]
1	**1e** (4-MeC$_6$H$_4$, PMP)	**2e**	69	97:3
2	**1f** (3-MeC$_6$H$_4$, PMP)	**2f**	91	98.5:1.5
3	**1g** (2-MeC$_6$H$_4$, PMP)	**2g**	77	98.5:1.5
4	**1h** (4-FC$_6$H$_4$, PMP)	**2h**	70	98:2
5	**1i** (4-ClC$_6$H$_4$, PMP)	**2i**	86	97:3
6	**1j** (4-BrC$_6$H$_4$, PMP)	**2j**	81	98:2
7	**1k** (PMP, PMP)	**2k**	87	95:5
8	**1l** (^{i}Pr, PMP)	**2l**	83	98:2
9	**1m** (cyclopropyl, PMP)	**2m**	89	98.5:1.5
10[d]	**1n** (^{t}Bu, PMP)	**2n**	35	95:5
11	**1o** (Bn, PMP)	**2o**	90	99:1
12	**1p** (allyl, PMP)	**2p**	95	98.5:1.5
13[d]	**1q** (HC≡C(CH$_2$)$_3$, PMP)	**2q**	45	98.5:1.5
14	**1r** (BnO(CH$_2$)$_3$, PMP)	**2r**	93	98.5:1.5
15	**1s** (ClCH$_2$(CH$_2$)$_2$, PMP)	**2s**	96	99:1
16[e, f]	**1t** (MeO$_2$C(CH$_2$)$_2$, PMP)	**2t**	60	99:1
17[d, e]	**1u** ((Me)PhNC(O)(CH$_2$)$_2$, PMP)	**2u**	53	98:2
18	**1v** (Me, Me)	**2v**[g]	88	98:2
19	**1w** (Me, Ph)	**2w**	98	99:1
20	**1x** (Me, 4-MeC$_6$H$_4$)	**2x**	93	98:2
21	**1y** (Me, 4-FC$_6$H$_4$)	**2y**	86	98.5:1.5
22	**1z** (Me, 2-naphthyl)	**2z**	85	99:1
23[e]	**1za** (Me, 4-MeC(O)C$_6$H$_4$)	**2za**[h]	65	98:2
24[i]	***ent*-1c** (Me, PMP)	***ent*-2c**	94	95:5

[a] Reaction conditions: **1** (0.30 mmol) and LiHMDS (0.36 mmol) in anhydrous THF (3.0 mL) at −78 °C for 15 min and then −35 °C for 10 min, followed by addition of chlorotrimethylsilane (0.60 mmol) at −35 °C unless otherwise noted. PMP = 4-methoxyphenyl. [b] Isolated yield after silica gel chromatography. [c] Enantiomeric ratios were determined using HPLC and a chiral stationary phase. [d] Incomplete conversion of the starting material. [e] 2.4 equiv of base and 4.0 equiv of TMSCl were used in this case. [f] Complete conversion of the starting material but substantial uncharacterized byproducts were observed. [g] Yield and enantiomeric ratio refer to the α-hydroxyl product after treatment of the rearrangement product with P(OMe)$_3$. [h] The acyl group at the *para*-position of the phenyl ring was simultaneously converted to silyl enol ether [4-CH$_2$=C(OTMS)C$_6$H$_4$)]. [i] The (*S*)-enantiomer of *N*-*tert*-butanesulfinamide was used.

Next we examined the substrate scope for the diastereoselective rearrangement of chiral *N*-acylsulfinamides

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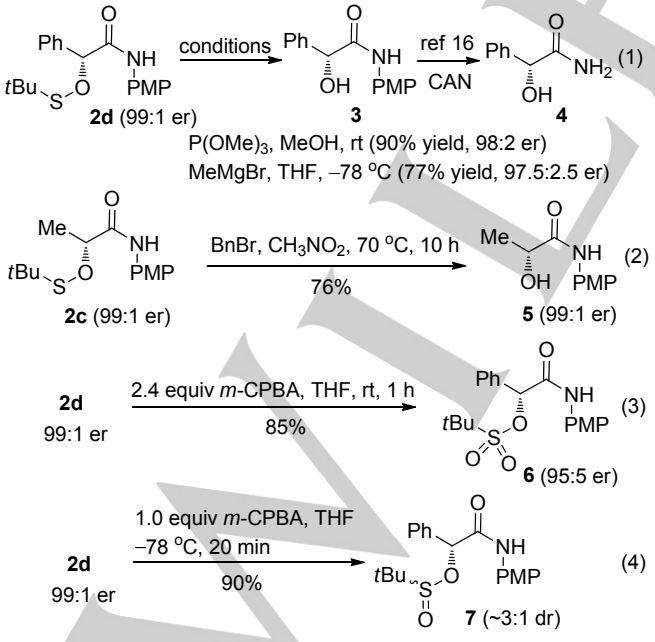
(Table 1). The *N*-arylacetyl sulfinamides **1e**–**k** bearing *ortho*-, *meta*-, and *para*-substituted aryl groups (R = Ar) smoothly underwent rearrangement, giving the corresponding α-sulfenyloxy carboxamides **2e**–**k** (entries 1–7) in good yields (69–91%) with excellent enantiomeric ratios (95:5–98.5:1.5). Reactions of *N*-acylsulfinamides derived from α-branched aliphatic acids (entries 8–10, R = ^{i}Pr, cyclopropyl, and ^{t}Bu) provided rearrangement products **2l–n** with good yields and enantioselectivity (95:5–98:2). The exception was the low yield (35%) of **2n,** which was due to low conversion of substrate **1n** (with a bulky α-substituent) under standard reaction conditions. Conducting enolization at higher temperatures did not improve yield of **2n**. A range of α-linear alkyl-substituted acylated sulfinamides containing aryl, vinyl, alkynyl, chloroalkyl, ester, or amide groups gave generally excellent enantiomeric ratios (>98:2, entries 11–17). Even single α-sulfenyloxylation of dicarboxylic derivatives was achieved (entries 16–17),[15] albeit in moderate yields. This reaction involved migration of the S–O moiety loaded onto one of the two carboxylic functionalities (**1t** and **1u**). Like *N*-acyl-sulfinamides containing *N*-ally, benzyl, and PMP groups (Scheme 2), precursors with *N*-methyl, phenyl, and functionalized phenyl groups underwent rearrangement to construct diverse *N*-substituted α-sulfenyloxy amides with excellent enantioselectivities (entries 18–23). Using the (S_S)-enantiomer of *N*-acyl-sulfinamides as starting material reversed the enantiomeric ratio for α-sulfenyloxy amide products. For example, the rearrangement reaction of ***ent*-1c** gave the enantioenriched (2*S*)-**2c** in excellent yield with good enantiocontrol (entry 24).

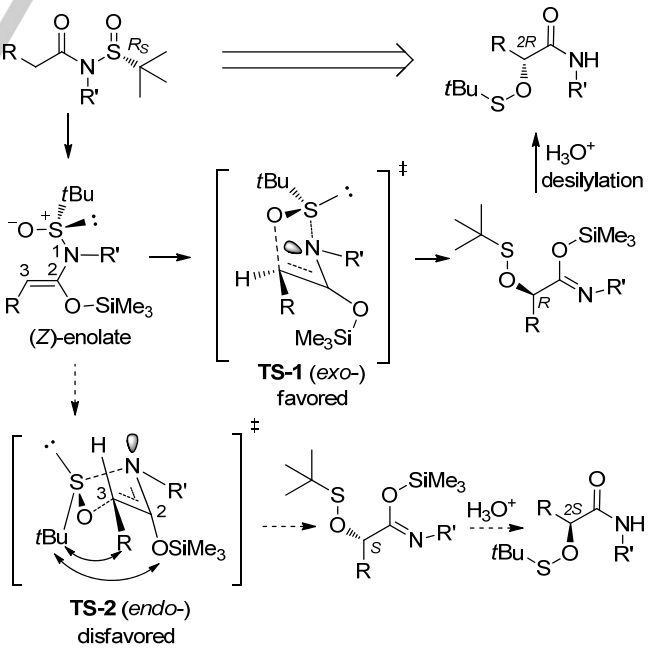
Rearrangement products were subsequently manipulated (Scheme 3). The common thiophile $P(OMe)_3$ easily cleaved the S–O bond of rearrangement product **2d** in methanol at room temperature, yielding α-hydroxyl amide **3** in 90% yield (eq. 1).

Grignard reagent MeMgBr effectively promoted bond cleavage at –78 °C (eq. 2). In both cases, enantiomeric ratio was maintained.[16] Under thio-Arbuzov reaction conditions (BnBr),[17] the expected α-bromo amide product derived from **2c** did not form; instead, the S–O bond cleavage product **5** was obtained in 76% yield with excellent enantiomeric ratio (eq. 3), indicating that the secondary alcohol-derived sulfenate ester **2c** is unsuitable for the thio-Arbuzov transformation. Adjustment of reaction conditions permitted selective oxidation of *tert*-butanesulfenate ester **2d** to the corresponding sulfonate ester **6** or sulfinate ester **7** (eq. 4).

We rationalize the observed enantioselectivity at the newly-formed stereocenter as follows. Mislow-Evans rearrangement is commonly thought to involve 5-membered cyclic *endo* transition states.[18] However, a bulky substituent at C-2 in the allylic system of rearrangement precursors can destabilize the *endo* transition state and thereby facilitate *exo* rearrangement.[19] We hypothesize that in this case, rearrangement occurs preferentially via an *exo* transition state **TS-1** in order to avoid interactions in the *endo* transition state **TS-2** between the *t*Bu group on the sulfur with the silyloxyl group at C-2 or with the R group at C-3 in the 1-aza-allylic system. The (*Z*)-enolate forms preferentially over the (*E*)-enolate because of severe steric repulsion between the bulky *N*-substituted sulfinamide group and the R group at the α-position in the *(E)*-enolate. This aza-variant of the Mislow-Evans rearrangement does not suffer the racemization sometimes observed in the traditional rearrangement during chirality transfer from sulfur to carbon. Such racemization arises in the traditional rearrangement because of its reversibility.[20] It does not appear to be a problem in the aza-rearrangement because quenching the reaction at low temperature triggers desilylation that quickly transforms *O*-silyl imidate to stable carboxamide.[21]



Scheme 3. Cleavage of the S–O Bond of α-Sulfenyloxy Amides and Oxidation of *tert*-Butanesulfenate ester.



Scheme 4. Rationalization of Observed Absolute Stereochemistry.

In summary, we have developed an aza-variation of the Mislow-Evans rearrangement that relies on formation of rearrangement precursors reminiscent of Ireland-Claisen rearrangement. Enolization and subsequent silylation of chiral *N*-acyl-*tert*-butanesulfinamides initiate a [2,3]-sigmatropic rearrangement with faithful chiral transfer from the sulfur of the sulfinyl group to the α-carbon of the amide. This rearrangement efficiently generates a range of α-sulfenyloxy amides with excellent enantioselectivities, allowing oxidant-free asymmetric functionalization of carboxamides on the α-oxygen.

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Keywords: diastereoselective • rearrangement • asymmetric • *N*-acyl-*tert*-butanesulfinamides •α-sulfenyloxy amides

[1] a) P. Bickart, F. W, Carson, J. Jacobus, E. G. Miller, K. Mislow, *J. Am. Chem. Soc.* **1968**, *90*, 4869−4876; b) R. Tang, K. Mislow, *J. Am. Chem. Soc.* **1970**, *92*, 2100−2104; c) D. A. Evans, G. C. Andrews, *Acc. Chem. Res.* **1974**, *7*, 147−155; d) C. M. Rojas In *Molecular Rearrangements in Organic Synthesis* (Ed.: Rojas, C. M.), John Wiley & Sons: Hoboken, NJ, 2016; pp. 569−625.

[2] a) S. Braverman, Y. Stabinsky, *Chem. Commun.* **1967**, 270−271; b) S. Braverman In *The Chemistry of Sulphones and Sulphoxide* (Eds.: S. Patai, Z. Rappoport, C. J. M. Stirling), John Wiley: London, 1988; Chapter 14; c) I. Colomer, M. Velado, R. Fernández de la Pradilla, V. Viso, *Chem. Rev.* **2017**, *117*, 14201−14243.

[3] M. G. Charest, C. D. Lerner, J. D. Brubaker, D. R. Siegel, A. G. Myers, *Science* **2005**, *308*, 395−398.

[4] Selected examples: a) J. G. Miller, W. Kurz, K. G. Untch, G. Stork, *J. Am. Chem. Soc.* **1974**, *96*, 6774−6775; b) R. L. Halcomb, S. H. Boyer, M. D. Wittman, S. H. Olson, D. J. Denhart, K. K. C. Liu, S. J. Danishefsky, *J. Am. Chem. Soc.* **1995**, *117*, 5720−5749; c) K. M. Engstrom, M. R. Mendoza, M. Navarro-Villalobos, D. Y. Gin, *Angew. Chem.* **2001**, *113*, 1162-1164; *Angew. Chem. Int. Ed.* **2001**, *40*, 1128−1130; d) C. He, C. Zhu, Z. Dai, C.-C. Tseng, H. Ding, *Angew. Chem.* **2013**, *125*, 13498–13502; *Angew. Chem. Int. Ed.* **2013**, *52*, 13256−13260.

[5] Tandem Claisen-Mislow-Evans rearrangement: a) M. J. Pelc, A. Zakarian, *Org. Lett.* **2005**, 7, 1629−1631; b) M. J. Pelc, A. Zakarian, *Tetrahedron Lett.* **2006**, 47, 7519−7523; Tandem Knoevenagel condensation/Mislow−Evans rearrangement (APAC reaction): c) Z. Du, T. Kawatani, K. Kataoka, R. Omatsu, J. Nokami, *Tetrahedron* **2012**, *68*, 2471−2480. d) J. de Vicente, J. R. Huckins, S. D. Rychnovsky, *Angew. Chem.* **2006**, *118*, 7416–7420; *Angew. Chem. Int. Ed.* **2006**, *45*, 7258−7262; e) B. M. Trost, L. Dong, G. M. Schroeder, *J. Am. Chem. Soc.* **2005**, *127*, 10259−10268. For other tandem processes involving Mislow-Evans rearrangement, see ref 2c.

[6] a) T. L. Gilchrist, C. J. Moody, *Chem. Rev.* **1977**, *77*, 409−435; (b) R. D. Baechler, M. Blohm, K. Rocco, *Tetrahedron Lett.* **1988**, *29*, 5353−5354; c) A. Armstrong, R. S. Cook, *Chem. Commun.* **2002**, 904−905; d) A. Armstrong, L. Challinor, R. S. Cooke, J. H. Moir, N. R. Treweeke, *J. Org. Chem.* **2006**, *71*, 4028−4030; e) A. Armstrong, D. P. G. Emmerson, *Org. Lett.* **2009**, *11*, 1547−1550. For rearrangement of allylic sulfoximines to allylic sulfinamides, see: f) H.-J. Gais, M. Scommoda, D. Lenz, *Tetrahedron Lett.* **1988**, *35*, 7361−7364.

[7] For a report on [3,3]-sigmatropic rearrangement reactions involvingsulfinamides, see: T. Moragas, R. M. Liffey, D. Regentová, J.-P. S. Ward, J. Dutton, W. Lewis, I. Churcher, L. Walton, J. A. Souto, R. A. Stockman, *Angew. Chem.* **2016**, *128*, 10201–10205; *Angew. Chem. Int. Ed.* **2016**, *55*, 10047–10051.

[8] For alkylation reaction of the lithiated enolate intermediate of *N*-acyl (R_S)-sulfinamides, see: B. J. Backes, D. R. Dragoli, J. A. Ellman, J*. Org. Chem.* **1999**, *64*, 5472–5478.

[9] Reviews: a) H. Ito, T. Taguchi, *Chem. Soc. Rev.* **1999**, *28*, 43–50; b) A. M. Martín Castro, *Chem. Rev.* **2004**, *104*, 2939–3002; c) E. A. Ilardi, C. E. Stivala, A. Zakarian, *Chem. Soc. Rev.* **2009**, *38*, 3133–3148.

[10] a) G. M. Coppola, H. F. Schuster, α-Hydroxy Acids in Enantioselective Syntheses; Wiley-VCH: Weinheim, **1997**; b) B.-C. Chen, P. Zhou, F. A. Davis, E. Ciganek In *Organic Reactions* (Eds.: L. E. Overman), John Wiley & Sons, Inc.: New York, **2003**, Vol. 62, pp 1−356.

[11] Reviews: a) J. A. Ellman, T. D. Owens, T. P. Tang, *Acc. Chem. Res.* **2002**, *35*, 984−995; b) M. T. Robak, M. A. Herbage, J. A. Ellman, *Chem. Rev.* **2010**, *110*, 3600−3740.

[12] On the high electrophilic reactivity of *N*-acylsulfinamides serving as sulfinylating agents, see: J. L. Garcia-Ruano, R. Alonso, M. M. Zarzuelo, P. Noheda, *Tetrahedron: Asymmetry* **1995**, *6*, 1133–1142.

[13] Crystal structures of **2a**-**d** (CCDC 1859325**–**1859328) are provided in the Supporting Information.

[14] X-ray crystallography studies showed respective Flack parameters *x*(*u*) of 0.016(17) and 0.003(9) for highly enantioenriched samples **1a** and **1b**. We consider the assignment of absolute configuration **1a** and **1b** based on these Flack parameters to be conclusive because of the sufficiently small standard uncertainty ($u < 0.04$) and the closeness of the Flack parameter to zero within three standard uncertainties ($|x|/u < 3.0$). For the use of the Flack parameter for absolute configuration determination, see: a) H. D. Flack, G. Bernardinelli, *J. Appl. Cryst.* **2000**, *33*, 1143–1148; b) H. D. Flack, G. Bernardinelli, *Chirality* **2008**, *20*, 681–690.

[15] For recent reports of selective oxidation of amides to α-hydroxy amides in the presence of other carbonyl groups, see: A. de la Torre, D. Kaiser, N. Maulide, *J. Am. Chem. Soc.* **2017**, *139*, 6578−6581.

[16] For removal of the *p*-methoxyphenyl group on the nitrogen in **3** using ceric ammonium nitrate (CAN), see: N. Kambe, T. Inoue, T. Takeda, S.-i. Fujiwara, N. Sonoda, *J. Am. Chem. Soc.* **2006**, *128*, 12650−12651.

[17] M. Kersten, E. Wenschuh, *Phosphorus, Sulfur Silicon Relat. Elem.* **1993**, *80*, 81–84.

[18] a) D. K. Jones-Hertzog, W. L. Jorgensen, *J. Am. Chem. Soc.* **1995**, *117*, 9077–9078; b) R. W. Hoffmann, *Angew. Chem.* **1979**, *91*, 625–634; *Angew. Chem. Int. Ed.* **1979**, *18*, 563−572.

[19] a) R. W. Hoffmann, S. Goldmann, R. Gerlach, N. Maak, *Chem. Ber.* **1980**, *113*, 845−855; b) S. Goldmann, R. W. Hoffmann, N. Maak, K.-J. Geueke, *Chem. Ber.* **1980**, *113*, 831−844. For an early report on the preferred *exo* transition states for both geometric isomers of *cis*- and *trans*-butenyl *p*-toluenesulfenates, see: c) V. Rautenstrauch, *J. Chem. Soc. D* **1970**, 526−527.

[20] a) P. Bickart, F. W. Carson, J. Jacobus, E. G. Miller, K. Mislow, *J. Am. Chem. Soc.* **1968**, *90*, 4869−4876; b) D. A. Evans, G. C. Andrews, *J. Am. Chem. Soc.* **1972**, *94*, 3672−3674; c) R. W. Hoffmann, N. Maak, *Tetrahedron Lett.* **1976**, *17*, 2237−2240.

[21] Control experiments indicated that treatment of α-sulfenyloxy carboxamide **2d** in THF with LiHMDS at −78 °C for 15 min and then −35 °C for 60 min resulted in complete S−O bond cleavage (Note: if the reaction was quenched at this stage, α-hydroxyl amide **3** was isolated in 81% yield). Subsequent addition of TMSCl to the reaction mixture led to silylation of the α-hydroxy group of **3**.

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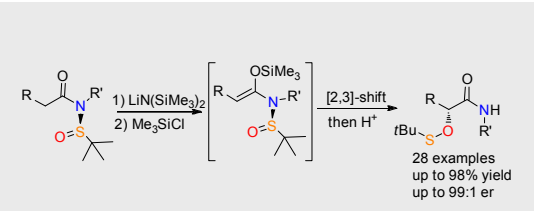

Aza-variation of the Mislow-Evans rearrangement that relies on formation of rearrangement precursors reminiscent of Ireland-Claisen rearrangement was developed. Enolization and subsequent silylation of chiral *N*-acyl-*tert*-butanesulfinamides initiate a [2,3]-sigmatropic rearrangement with faithful chiral transfer from the sulfur of the sulfinyl group to the α-carbon of the amide.

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