Chemoselective Syntheses of γ -Butyrolactams using Vinyl Sulfilimines and Dichloroketene

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Supporting Information

General

All reactions were conducted in flame dried glassware under nitrogen. All solvents were purified before use. THF and Et₂O were dried by distillation from sodium benzophenone ketyl. CH₂Cl₂, DMF, CH₃CN were dried by distillation from CaH₂. Methanol was distilled from magnesium turnings. Toluene was dried by distillation from sodium. All other commercially available reagents and solvents were used as received.

¹H NMR data were recorded at 500 MHz or 400MHz using a Varian INOVA 500 or a Bruker Avance 400 instrument respectively. ¹H NMR chemical shifts are reported as delta (δ) units in parts per million (ppm) relative to residual CHCl₃ (7.26 ppm). ¹³C NMR data were recorded at 125 MHz or 100 MHz using a Varian INOVA 500 or a Bruker Avance 400 instrument respectively. Coupling constants (*J*) were reported in Hertz (Hz). ¹³C NMR chemical shifts were reported as delta (δ) units in parts per million (ppm) relative to the central line of CDCl₃ (77.0 ppm). Infrared spectra were recorded using a Perkin Elmer Paragon 1000 FT-IR and were reported in wavelength numbers (cm⁻¹). High resolution mass spectroscopy was performed on a JOEL-AX505HA mass spectrometer at the University of Notre Dame Mass Spectrometry Facility.

Reactions were monitored by thin-layer chromatography on 0.25 mm E. Merck silica gel 60 plates (F₂₅₄) using UV light and ammonium molybdate-cerium ammonium nitrate as visualizing agents. Column chromatographic purification were performed using Scientific Adsorbents Flash Silica Gel 60 (32-63 μ) unless indicated otherwise. All

compounds purified by chromatography were sufficiently pure for use in further experiments, unless indicated otherwise.

General Lactamization Procedure (synthesis of lactam **9 of Table 2 as an example)**

To a dry flask equipped with magnetic stir bar, temperature probe and a condenser was added zinc powder (500 mg, 7.35 mmol), copper (I) chloride (728 mg, 7.35 mmol) and anhydrous THF 4 mL. Heat the reaction mixture to reflux under nitrogen and keep it over 1.5 hours. Cool the reaction to -30°C. Transfer sulfilimine **8** (135 mg, 0.37 mmol) in THF 3 mL to the zinc-copper mixture via cannula. While keeping the reaction at -30°C, charge trichloroacetyl chloride (205 μ L, 1.84 mmol) to the reaction via a syringe pump in 0.5 hour. Sample the reaction for TLC monitoring. Upon the disappearance of sulfilimine, the reaction mixture was filtered through a celite pad into sodium bicarbonate solution 5 mL. Extract the filtrate solution with ethyl acetate (2×10 mL). Wash the combined organic layers with brine 5 mL. Dry the organic solution with magnesium sulfate. Filter. Remove solvent in vacuo to give crude product lactam **9**. Purify the crude product via silica gel chromatography with ethyl acetate / hexanes (5:95) to give 145 mg (82%) of lactam **9**.

Lactam 6a

3,3-Dichloro-4-phenyl-5-phenylsulfanyl-1-(toluene-4-sulfonyl)-pyrrolidin-2-one
(Table 1, entry a)

^1H NMR (500 MHz CDCl_3) δ 8.20 (d, $J = 8.4$ Hz, 2 H), 7.48-7.25 (m, 10 H), 7.08 (m, 2 H), 5.70 (d, $J = 8.3$ Hz, 1 H), 3.57 (d, $J = 8.3$ Hz, 1 H), 2.52 (s, 3 H); ^{13}C NMR (125 MHz CDCl_3) δ 163.8, 146.5, 135.9, 134.6, 130.2, 130.18, 130.06, 130.0, 129.8, 129.7, 129.6, 129.0, 128.9, 83.4, 67.4, 59.6, 22.1; IR (thin film) 2924, 1760, 1372, 1226, 1187, 1169, 1085, 975, 873 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{23}\text{H}_{20}\text{Cl}_2\text{NO}_3\text{S}_2$, 492.0262 m/z ($\text{M} + \text{H}$) $^+$; observed 492.0252.

Lactam 6b

3,3-Dichloro-1-(4-chloro-benzenesulfonyl)-4-phenyl-5-phenylsulfanyl-pyrrolidin-2-one (Table 1, entry b)

^1H NMR (500 MHz CDCl_3) δ 8.27 (d, J = 8.7 Hz, 2 H), 7.64 (d, J = 8.6 Hz, 2 H), 7.50-7.26 (m, 8 H), 7.07 (d, J = 7.2 Hz, 2 H), 5.71 (d, J = 8.3 Hz, 1 H), 3.61 (d, J = 8.4 Hz, 1 H); ^{13}C NMR (125 MHz CDCl_3) δ 163.7, 142.0, 135.9, 135.6, 130.9, 130.2, 130.1, 129.8, 129.74, 129.70, 129.68, 129.0, 128.8, 83.1, 67.6, 59.8; IR (thin film) 2923, 1766, 1584, 1476, 1380, 1230, 1185, 1174, 1093, 976, 759, 693 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{22}\text{H}_{17}\text{Cl}_3\text{NO}_3\text{S}_2$, 511.9715 m/z ($\text{M} + \text{H}$) $^+$; observed 511.9726.

Lactone Imine 7b

4-Chloro-N-(3,3-dichloro-4-phenyl-5-phenylsulfanyl-dihydro-furan-2-ylidene)-benzenesulfonamide (Table 1, entry b)

^1H NMR (500 MHz CDCl_3) δ 8.02 (d, J = 8.6 Hz, 2 H), 7.54 (d, J = 8.6 Hz, 2 H), 7.51-7.43 (m, 6 H), 7.32-7.29 (m, 4 H), 6.19 (d, J = 10.5 Hz, 1 H), 3.72 (d, J = 10.5 Hz, 1 H); ^{13}C NMR (125 MHz CDCl_3) δ 165.3, 140.0, 138.8, 135.1, 130.4, 130.0, 129.9, 129.8, 129.4, 129.3, 129.1, 128.4, 128.1, 93.6, 84.1, 61.3; IR (thin film) 3064, 2923, 1665, 1340, 1167, 1092, 770 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{22}\text{H}_{17}\text{Cl}_3\text{NO}_3\text{S}_2$, 511.9715 m/z ($\text{M} + \text{H}$) $^+$; observed 511.9706.

Lactam 6c

3,3-Dichloro-1-(4-methoxy-benzenesulfonyl)-4-phenyl-5-phenylsulfanyl-pyrrolidin-2-one (Table 1, entry c)

^1H NMR (500 MHz CDCl_3) δ 8.25 (d, J = 9.0 Hz, 2 H), 7.48-7.26 (m, 8 H), 7.12 (d, J = 7.9 Hz, 2 H), 7.10 (d, J = 9.1 Hz, 2 H), 5.69 (d, J = 8.3 Hz, 1 H), 3.94 (s, 3 H), 3.59 (d, J = 8.2 Hz, 1 H); ^{13}C NMR (125 MHz CDCl_3) δ 164.9, 163.7, 135.8, 134.7, 132.0, 130.08, 130.05, 129.65, 129.60, 128.9, 128.6, 127.2, 83.1, 67.3, 59.5, 56.0; IR (thin film) 3063, 2945, 1763, 1594, 1498, 1374, 1267, 1191, 1167, 1089, 1025, 976, 835, 805, 756, 738, 693 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{23}\text{H}_{20}\text{Cl}_2\text{NO}_4\text{S}_2$, 508.0211 m/z ($\text{M} + \text{H}$) $^+$; observed 508.0237.

Lactone Imine 7c

N-(3,3-Dichloro-4-phenyl-5-phenylsulfanyl-dihydro-furan-2-ylidene)-4-methoxy-benzenesulfonamide (Table 1, entry c)

^1H NMR (500 MHz CDCl_3) δ 8.02 (d, J = 8.8 Hz, 2 H), 7.52-7.42 (m, 8 H), 7.30 (d, J = 8.5 Hz, 2 H), 7.03 (d, J = 8.8 Hz, 2 H), 6.15 (d, J = 10.5 Hz, 1 H), 3.91 (s, 3 H), 3.69 (d, J = 10.5 Hz, 1 H); ^{13}C NMR (125 MHz CDCl_3) δ 164.4, 163.6, 135.0, 131.9, 130.3, 130.2, 130.2, 130.0, 129.9, 129.1, 128.6, 128.3, 114.2, 93.1, 84.2, 61.3, 55.8; IR (thin film) 3064, 1666, 1596, 1498, 1337, 1262, 1159, 1093, 1022, 806, 743, 692 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{23}\text{H}_{20}\text{Cl}_2\text{NO}_4\text{S}_2$, 508.0211 m/z ($\text{M} + \text{H}$) $^+$; observed 508.0244.

Lactam 6f

3,3-Dichloro-4-phenyl-1-(toluene-4-sulfonyl)-5-p-tolylsulfanyl-pyrrolidin-2-one

(Table 1, entry f)

^1H NMR (500 MHz CDCl_3) δ 8.21 (d, $J = 8.4$ Hz, 2 H), 7.47-7.44 (m, 9 H), 7.29-7.27 (m, 2 H), 7.06 (d, $J = 8.0$ Hz, 2 H), 6.91 (d, $J = 8.1$ Hz, 2 H), 5.67 (d, $J = 8.5$ Hz, 1 H), 3.55 (d, $J = 8.5$ Hz, 1 H), 2.52 (s, 3 H), 2.35 (s, 3 H); ^{13}C NMR (125 MHz CDCl_3) δ 163.7, 146.4, 140.6, 136.0, 134.6, 130.4, 130.2, 129.94, 129.85, 129.6, 129.5, 128.9, 124.8, 83.5, 67.2, 59.1, 22.0, 21.4; IR (thin film) 3035, 2923, 1765, 1596, 1493, 1456, 1374, 1310, 1232, 1174, 1085, 977, 910, 875, 814, 764, 702, 662, 567 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{24}\text{H}_{22}\text{Cl}_2\text{NO}_3\text{S}_2$, 506.0418 m/z ($\text{M} + \text{H}$) $^+$; observed 506.0403.

Lactone Imine 7f

N-(3,3-Dichloro-4-phenyl-5-p-tolylsulfanyl-dihydro-furan-2-ylidene)-4-methyl-benzenesulfonamide (Table 1, entry f)

^1H NMR (500 MHz CDCl_3) δ 7.98-7.96 (m, 2 H), 7.49-7.27 (m, 9 H), 7.21 (d, $J = 8.0$ Hz, 2 H), 6.10 (d, $J = 10.5$ Hz, 1 H), 3.63 (d, $J = 10.5$ Hz, 1 H), 2.47 (s, 3 H), 2.41 (s, 3 H); ^{13}C NMR (125 MHz CDCl_3) δ 164.8, 144.4, 140.9, 137.5, 135.6, 130.7, 130.0, 129.7, 129.1, 128.7, 128.0, 124.2, 93.3, 84.4, 61.2, 22.0, 21.6; IR (thin film) 3035, 2923, 1668, 1597, 1495, 1456, 1337, 1239, 1164, 1091, 1018, 911, 853, 815, 745, 698, 654, 611, 567 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{24}\text{H}_{22}\text{Cl}_2\text{NO}_3\text{S}_2$, 506.0418 m/z ($\text{M} + \text{H}$) $^+$; observed 506.0433.

Lactam 6g

3,3-Dichloro-5-(4-chloro-phenylsulfanyl)-4-phenyl-1-(toluene-4-sulfonyl)-pyrrolidin-2-one (Table 1, entry g)

^1H NMR (500 MHz CDCl_3) δ 8.17 (d, $J = 8.3$ Hz, 2 H), 7.49-7.44 (m, 5 H), 7.28-7.24 (m, 4 H), 7.04 (d, $J = 8.6$ Hz, 2 H), 5.65 (d, $J = 8.3$ Hz, 1 H), 3.60 (d, $J = 8.3$ Hz, 1 H), 2.52 (s, 3 H); ^{13}C NMR (125 MHz CDCl_3) δ 163.5, 146.6, 137.0, 136.6, 134.3, 130.1, 130.0, 129.8, 129.7, 129.5, 129.0, 127.6, 83.1, 67.7, 60.1, 22.1; IR (thin film) 3066, 2923, 1766, 1596, 1476, 1375, 1310, 1231, 1191, 1173, 1092, 1014, 976, 910, 876, 815, 765, 736, 701, 662, 569, 547 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{23}\text{H}_{19}\text{Cl}_3\text{NO}_3\text{S}_2$, 526.9872 m/z ($\text{M} + \text{H}$) $^+$; observed 526.9897.

Lactone Imine 7g

N-[3,3-Dichloro-5-(4-chloro-phenylsulfanyl)-4-phenyl-dihydro-furan-2-ylidene]-4-methyl-benzenesulfonamide (Table 1, entry g)

^1H NMR (500 MHz CDCl_3) δ 7.96 (d, $J = 8.3$ Hz, 2 H), 7.51-7.40 (m, 7 H), 7.37 (d, $J = 8.1$ Hz, 2 H), 7.31-7.29 (m, 2 H), 6.13 (d, $J = 10.4$ Hz, 1 H), 3.67 (d, $J = 10.4$ Hz, 1 H), 2.48 (s, 3 H); ^{13}C NMR (125 MHz CDCl_3) δ 164.4, 144.4, 137.4, 137.0, 136.6, 130.11, 130.07, 129.8, 129.7, 129.1, 128.3, 127.8, 126.4, 92.5, 84.0, 61.3, 21.9; IR (thin film) 2923, 1667, 1477, 1335, 1238, 1164, 1093, 1014, 910, 814, 741, 698 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{23}\text{H}_{19}\text{Cl}_3\text{NO}_3\text{S}_2$, 525.9872 m/z ($\text{M} + \text{H}$) $^+$; observed 525.9879.

Lactam 6h

3,3-Dichloro-5-(4-methoxy-phenylsulfanyl)-4-phenyl-1-(toluene-4-sulfonyl)-pyrrolidin-2-one (Table 1, entry h)

^1H NMR (500 MHz CDCl_3) δ 8.21 (d, $J = 8.4$ Hz, 2 H), 7.45-7.43 (m, 5 H), 7.28-7.26 (m, 2 H), 6.94 (d, $J = 8.8$ Hz, 2 H), 6.76 (d, $J = 8.8$ Hz, 2 H), 5.61 (d, $J = 8.5$ Hz, 1 H), 3.80 (s, 3 H), 3.50 (d, $J = 8.7$ Hz, 1 H), 2.50 (s, 3 H); ^{13}C NMR (125 MHz CDCl_3) δ 163.7, 161.3, 146.4, 138.1, 134.5, 130.2, 129.9, 129.7, 129.5, 128.9, 118.5, 115.1, 83.5, 67.3, 58.8, 55.5, 22.0; IR (thin film) 2948, 1762, 1587, 1494, 1370, 1289, 1247, 1169, 1087, 1025, 973, 911, 875, 659 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{24}\text{H}_{22}\text{Cl}_2\text{NO}_4\text{S}_2$, 522.0367 m/z ($\text{M} + \text{H}$) $^+$; observed 522.0388.

Lactone Imine 7h

N-[3,3-Dichloro-5-(4-methoxy-phenylsulfanyl)-4-phenyl-dihydro-furan-2-ylidene]-4-methyl-benzenesulfonamide (Table 1, entry h)

^1H NMR (500 MHz CDCl_3) δ 7.98 (d, $J = 8.3$ Hz, 2 H), 7.49-7.37 (m, 5 H), 7.30-7.28 (m, 2 H), 6.93 (d, $J = 8.7$ Hz, 2 H), 6.08 (d, $J = 10.4$ Hz, 1 H), 3.88 (s, 3 H), 3.61 (d, $J = 10.4$ Hz, 1 H), 2.48 (s, 3 H); ^{13}C NMR (125 MHz CDCl_3) δ 164.8, 161.6, 144.3, 137.7, 137.4, 129.93, 129.90, 129.6, 129.0, 128.6, 127.9, 117.5, 115.3, 93.2, 84.3, 60.9, 55.6, 21.9; IR (thin film) 2947, 1664, 1588, 1490, 1331, 1244, 1157, 1086, 1024, 742 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{24}\text{H}_{22}\text{Cl}_2\text{NO}_4\text{S}_2$, 522.0367 m/z ($\text{M} + \text{H}$) $^+$; observed 522.0388.

Lactam 6i

3,3-Dichloro-5-hexylsulfanyl-4-phenyl-1-(toluene-4-sulfonyl)-pyrrolidin-2-one

(Table 1, entry i)

^1H NMR (500 MHz CDCl_3) δ 8.13 (d, $J = 8.3$ Hz, 2 H), 7.46-7.36 (m, 7 H), 5.46 (d, $J = 7.8$ Hz, 1 H), 3.85 (d, $J = 7.8$ Hz, 1 H), 2.80 (t, $J = 7.4$ Hz, 2 H), 2.48 (s, 3 H), 1.47-1.33 (m, 2 H), 1.25-1.12 (m, 6 H), 0.85 (t, $J = 7.0$ Hz, 3 H); ^{13}C NMR (125 MHz CDCl_3) δ 163.8, 146.2, 134.9, 131.1, 129.9, 129.8, 129.6, 129.2, 129.0, 82.9, 67.6, 62.8, 34.2, 31.4, 29.5, 28.4, 22.6, 22.0, 14.2; IR (thin film) 2925, 1763, 1372, 1225, 1171, 1083, 971, 697, 658 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{23}\text{H}_{28}\text{Cl}_2\text{NO}_3\text{S}_2$, 500.0888 m/z ($\text{M}+\text{H}$) $^+$; observed 500.0911.

Lactam 6j

3,3-Dichloro-5-cyclohexylsulfanyl-4-phenyl-1-(toluene-4-sulfonyl)-pyrrolidin-2-one

(Table 1, entry j)

^1H NMR (500 MHz CDCl_3) δ 8.12 (d, $J = 8.3$ Hz, 2 H), 7.44-7.42 (m, 3 H), 7.40 (d, $J = 8.5$ Hz, 2 H), 7.36-7.34 (m, 2 H), 5.50 (d, $J = 7.0$ Hz, 1 H), 3.33-3.29 (m, 1 H), 2.48 (s, 3 H), 1.99-1.96 (m, 1 H), 1.77-1.70 (m, 2 H), 1.60-1.54 (m, 2 H), 1.40-1.07 (m, 5 H); ^{13}C NMR (125 MHz CDCl_3) δ 163.8, 146.2, 134.9, 131.8, 129.8, 129.6, 129.3, 128.9, 82.9, 66.7, 63.9, 46.8, 34.9, 32.7, 26.1, 25.6, 25.5, 22.0; IR (thin film) 2926, 2896, 1760, 1595, 1446, 1371, 1166, 1067, 972, 740, 698, 658 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{23}\text{H}_{25}\text{Cl}_2\text{NO}_3\text{S}_2$, 497.0653 m/z M^+ ; observed 497.0628.

Lactam 6k

5-tert-Butylsulfanyl-3,3-dichloro-4-phenyl-1-(toluene-4-sulfonyl)pyrrolidin-2-one

(Table 1, entry k)

^1H NMR (500 MHz CDCl_3) δ 8.13 (d, $J = 8.4$ Hz, 2 H), 7.41-7.39 (m, 3 H), 7.23-7.21 (m, 2 H), 5.48 (d, $J = 2.3$ Hz, 1 H), 4.12 (d, $J = 2.2$ Hz, 1 H), 2.49 (s, 3 H), 1.35 (s, 9 H); ^{13}C NMR (125 MHz CDCl_3) δ 170.9, 146.4, 136.2, 134.4, 129.9, 129.7, 129.52, 129.47, 128.5, 66.8, 65.4, 46.2, 31.6, 30.0, 22.1; IR (thin film) 2963, 1763, 1595, 1496, 1458, 1370, 1328 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{21}\text{H}_{23}\text{Cl}_2\text{NO}_3\text{S}_2$, 472.0575 m/z M^+ ; observed 472.0597.

Lactam 6l

5-Benzylsulfanyl-3,3-dichloro-4-phenyl-1-(toluene-4-sulfonyl)pyrrolidin-2-one

(Table 1, entry l)

^1H NMR (500 MHz CDCl_3) δ 8.14 (d, $J = 8.3$ Hz, 2 H), 7.42-7.17 (m, 10 H), 6.82 (d, $J = 7.4$ Hz, 2 H), 5.32 (d, $J = 8.2$ Hz, 1 H), 4.34 (d, $J = 13.2$ Hz, 1 H), 3.88 (d, $J = 13.2$ Hz, 1 H), 3.69 (d, $J = 8.2$ Hz, 1 H), 2.48 (s, 3 H); ^{13}C NMR (125 MHz CDCl_3) δ 163.9, 146.3, 136.7, 134.7, 130.1, 129.9, 129.7, 129.5, 129.4, 129.2, 129.0, 128.7, 127.7, 82.8, 65.4, 62.3, 38.1, 22.0; IR (thin film) 3032, 1764, 1597, 1495, 1372, 1229, 1174, 1087, 1074, 977, 764, 701, 662 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{24}\text{H}_{22}\text{Cl}_2\text{NO}_3\text{S}_2$, 506.0418 m/z ($\text{M} + \text{H}$) $^+$; observed 506.0395.

Lactam 9

**4-Butyl-3,3-dichloro-5-cyclohexylsulfanyl-1-(toluene-4-sulfonyl)-pyrrolidin-2-one
(Table 2, entry 1)**

^1H NMR (500 MHz CDCl_3) δ 8.05 (d, $J = 8.4$ Hz, 2 H), 7.36 (d, $J = 8.1$ Hz, 2 H), 4.82 (d, $J = 7.9$ Hz, 1 H), 3.40 (m, 1 H), 2.52 (dt, $J = 8.2, 4.7$ Hz, 1 H), 2.46 (s, 3 H), 2.05-1.26 (m, 16 H); ^{13}C NMR (125 MHz CDCl_3) δ 164.3, 146.0, 135.0, 129.7, 129.1, 83.6, 67.3, 56.2, 46.6, 35.5, 32.8, 29.0, 27.4, 26.3, 25.8, 25.7, 22.7, 22.0, 13.9; IR (thin film) 2927, 2845, 1762, 1593, 1444, 1372, 1229, 1173, 1080, 978, 812, 704, 679, 661, 578 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{21}\text{H}_{30}\text{Cl}_2\text{NO}_3\text{S}_2$, 478.1044 m/z ($\text{M}+\text{H}$) $^+$; observed 478.1034.

Lactam 11

4-(tert-Butyl-dimethyl-silanyloxymethyl)-3,3-dichloro-5-cyclohexylsulfanyl-1-(toluene-4-sulfonyl)-pyrrolidin-2-one (Table 2, entry 2)

^1H NMR (500 MHz CDCl_3) δ 8.06 (d, $J = 8.4$ Hz, 2 H), 7.36 (d, $J = 8.2$ Hz, 2 H), 5.45 (d, $J = 2.3$ Hz, 1 H), 4.02 (dd, $J = 10.6, 5.1$ Hz, 1 H), 3.70 (dd, $J = 10.6, 7.1$ Hz, 1 H), 3.33-3.28 (m, 1 H), 3.08-3.05 (m, 1 H), 2.46 (s, 3 H), 2.12-1.26 (m, 10 H), 0.94 (s, 9 H), 0.13 (s, 6 H); ^{13}C NMR (125 MHz CDCl_3) δ 163.6, 146.1, 134.6, 129.8, 129.2, 81.7, 64.0, 61.4, 60.1, 47.2, 35.5, 32.8, 26.2, 26.0, 25.7, 22.0, 18.5, -5.4; IR (thin film) 2930, 2856, 1764, 1597, 1471, 1449, 1376, 1333, 1258, 1190, 1176, 1115, 1084, 997, 972, 837, 813, 780, 703, 679, 662 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{24}\text{H}_{38}\text{Cl}_2\text{NO}_4\text{S}_2\text{Si}$, 566.1389 m/z ($\text{M}+\text{H}$) $^+$; observed 566.1367.

Lactam 13

Acetic acid 4,4-dichloro-2-cyclohexylsulfanyl-5-oxo-1-(toluene-4-sulfonyl)-pyrrolidin-3-ylmethyl ester (Table 2, entry 3)

^1H NMR (500 MHz CDCl_3) δ 8.05 (d, $J = 8.4$ Hz, 2 H), 7.36 (d, $J = 8.2$ Hz, 2 H), 5.21 (d, $J = 4.8$ Hz, 1 H), 4.52 (dd, $J = 11.9, 5.8$ Hz, 1 H), 4.45 (dd, $J = 11.8, 4.7$ Hz, 1 H), 3.38-3.33 (m, 1 H), 3.13 (dd, $J = 10.3, 4.8$ Hz, 1 H), 2.45 (s, 3 H), 2.09 (s, 3 H), 2.04-1.24 (m, 10 H); ^{13}C NMR (125 MHz CDCl_3) δ 170.6, 163.4, 146.4, 134.6, 130.0, 129.3, 81.4, 63.9, 61.5, 56.8, 47.1, 35.6, 32.8, 26.3, 25.9, 25.8, 22.1, 20.9; IR (thin film) 2930, 2853, 1762, 1596, 1449, 1373, 1226, 1175, 1085, 813, 664, 577 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{20}\text{H}_{26}\text{Cl}_2\text{NO}_5\text{S}_2$, 492.0473 m/z ($\text{M}-\text{H}$) $^+$; observed 492.0480.

Lactam 15

3,3-Dichloro-5-cyclohexylsulfanyl-4-morpholin-4-ylmethyl-1-(toluene-4-sulfonyl)-pyrrolidin-2-one (Table 2, entry 4)

^1H NMR (500 MHz CDCl_3) δ 8.05 (d, $J = 8.3$ Hz, 2 H), 7.37 (d, $J = 8.3$ Hz, 2 H), 5.55 (d, $J = 2.8$ Hz, 1 H), 3.76-3.69 (m, 4 H), 3.43-3.39 (m, 1 H), 3.11-3.07 (m, 1 H), 2.77 (dd, $J = 13.0, 5.7$ Hz, 1 H), 2.60-2.59 (m, 2 H), 2.49-2.45 (m, 4 H), 2.36 (dd, $J = 12.8, 2.5$ Hz, 1 H), 2.19-1.26 (m, 11 H); ^{13}C NMR (125 MHz CDCl_3) δ 163.6, 146.2, 134.4, 129.8, 129.2, 82.6, 67.0, 64.5, 58.4, 55.6, 53.9, 46.9, 35.2, 32.7, 26.3, 25.8, 25.7, 22.0; IR (thin film) 2929, 2853, 1761, 1596, 1449, 1374, 1175, 1118, 1090, 972, 872, 813, 736, 681, 662, 578, 546 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{22}\text{H}_{31}\text{Cl}_2\text{N}_2\text{O}_4\text{S}_2$, 521.1102 m/z ($\text{M}+\text{H}$) $^+$; observed 521.1044.

Lactam 17

3,3-Dichloro-5-cyclohexylsulfanyl-4-phenyl-1-(toluene-4-sulfonyl)-pyrrolidin-2-one
(Table 2, entry 5)

^1H NMR (500 MHz CDCl_3) δ 8.13 (d, $J = 8.4$ Hz, 2 H), 7.64 (d, $J = 6.8$ Hz, 2 H), 7.44-7.38 (m, 5 H), 5.61 (d, $J = 6.4$ Hz, 1 H), 4.26 (d, $J = 6.4$ Hz, 1 H), 2.91-2.87 (m, 1 H), 2.49 (s, 3 H), 2.01-1.98 (m, 1 H), 1.71-1.68 (m, 1 H), 1.57-0.88 (m, 8 H); ^{13}C NMR (125 MHz CDCl_3) δ 161.0, 148.7, 140.9, 136.3, 129.5, 128.2, 126.3, 125.7, 125.4, 97.1, 46.2, 36.0, 33.8, 33.7, 26.7, 23.8, 20.9; IR (thin film) 2916, 1764, 1598, 1372, 1173, 1002, 968, 872, 813, 694, 662, 544 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{23}\text{H}_{26}\text{Cl}_2\text{NO}_3\text{S}_2$, 498.0731 m/z ($\text{M}+\text{H}$) $^+$; observed 498.0745.

Lactam 19

4-Butyl-3,3-dichloro-5-cyclohexylsulfanyl-1-(toluene-4-sulfonyl)-pyrrolidin-2-one
(Table 2, entry 6)

^1H NMR (500 MHz CDCl_3) δ 8.06 (d, $J = 8.4$ Hz, 2 H), 7.36 (d, $J = 8.1$ Hz, 2 H), 5.47 (d, $J = 7.0$ Hz, 1 H), 3.32-3.28 (m, 1 H), 2.99-2.95 (m, 1 H), 2.46 (s, 3 H), 2.05-1.27 (m, 16 H); ^{13}C NMR (125 MHz CDCl_3) δ 164.2, 146.3, 134.6, 129.9, 129.3, 84.1, 66.8, 54.8, 46.9, 35.3, 33.3, 28.7, 26.5, 26.3, 25.8, 23.0, 22.1, 14.1; IR (thin film) 2930, 2855, 1760, 1597, 1449, 1372, 1322, 1190, 1174, 1088, 972 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{21}\text{H}_{30}\text{Cl}_2\text{NO}_3\text{S}_2$, 478.1044 m/z ($\text{M}+\text{H}$) $^+$; observed 478.1032.

Lactam 21

4-Butyl-3,3-dichloro-5-cyclohexylsulfanyl-4-methyl-1-(toluene-4-sulfonyl)-pyrrolidin-2-one (Table 2, entry 7)

^1H NMR (500 MHz CDCl_3) δ 8.04 (d, $J = 8.4$ Hz, 2 H), 7.36 (d, $J = 8.2$ Hz, 2 H), 5.10 (s, 1 H), 3.30-3.26 (m, 1 H), 2.46 (s, 3 H), 2.10-2.02 (m, 3 H), 1.82-1.26 (m, 16 H), 0.92 (t, $J = 7.1$ Hz, 3 H); ^{13}C NMR (125 MHz CDCl_3) δ 164.0, 146.1, 134.6, 129.8, 129.1, 89.1, 73.8, 52.5, 47.2, 35.4, 34.0, 33.1, 26.3, 25.8, 25.75, 25.67, 23.8, 23.5, 22.0, 14.1; IR (thin film) 2931, 2855, 1760, 1597, 1450, 1372, 1325, 1240, 1174, 1089, 1000, 911, 835, 814, 733, 661 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{22}\text{H}_{32}\text{Cl}_2\text{NO}_3\text{S}_2$, 492.1201 m/z ($\text{M}+\text{H}$) $^+$; observed 492.1187.

Lactam 23

3,3-Dichloro-7a-cyclohexylsulfanyl-1-(toluene-4-sulfonyl)-octahydro-indol-2-one (Table 2, entry 8)

^1H NMR (500 MHz CDCl_3) δ 8.00 (d, $J = 8.4$ Hz, 2 H), 7.35 (d, $J = 8.1$ Hz, 2 H), 2.92-2.88 (m, 2 H), 2.74-2.69 (m, 1 H), 2.45 (s, 3 H), 2.28-1.17 (m, 17 H); ^{13}C NMR (125 MHz CDCl_3) δ 164.2, 145.9, 134.8, 129.6, 129.5, 83.6, 77.5, 51.4, 43.3, 35.1, 34.8, 34.0, 26.4, 26.3, 25.5, 21.95, 21.86, 20.8, 20.6; IR (thin film) 2930, 2854, 1754, 1597, 1449, 1375, 1250, 1177, 1084, 995, 966, 908, 874, 733, 663, 596 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{21}\text{H}_{28}\text{Cl}_2\text{NO}_3\text{S}_2$, 476.0888 m/z ($\text{M}+\text{H}$) $^+$; observed 476.0860.

Lactam 24

3,3-Dichloro-5-isopropylsulfanyl-4-phenyl-1-(toluene-4-sulfonyl)-pyrrolidin-2-one (Scheme 2)

^1H NMR (400 MHz CDCl_3) δ 8.10 (d, $J = 8.4$ Hz, 2 H), 7.45-7.33 (m, 7 H), 5.47 (d, $J = 7.1$ Hz, 1 H), 3.83 (d, $J = 7.1$ Hz, 1 H), 3.56 (sept, $J = 6.7$ Hz, 1 H), 2.47 (s, 3 H), 1.23 (d, $J = 6.9$ Hz, 3 H), 1.11 (d, $J = 6.9$ Hz, 3 H); ^{13}C NMR (100 MHz CDCl_3) δ 163.8, 146.2, 134.8, 131.7, 129.84, 129.78, 129.6, 129.3, 128.9, 82.9, 67.1, 63.6, 38.5, 24.9, 22.7, 22.0; IR (thin film) 2925, 2890, 1762, 1590, 1440, 1370, 1166, 1060, 975, 740, 695 cm^{-1} ; LRMS (FAB) calculated for $\text{C}_{20}\text{H}_{21}\text{Cl}_2\text{NO}_3\text{S}_2$, 458 m/z ($\text{M}+\text{H}$) $^+$; observed 458, 382, 155, 136; HRMS (FAB) calculated for $\text{C}_{20}\text{H}_{22}\text{Cl}_2\text{NO}_3\text{S}_2$, 458.0418 m/z ($\text{M}+\text{H}$) $^+$; observed 458.0433.

Lactam 25

5-Isopropylsulfanyl-4-phenyl-1-(toluene-4-sulfonyl)-pyrrolidin-2-one (Scheme 2)

^1H NMR (400 MHz CDCl_3) δ 7.92-7.89 (m, 2 H), 7.30-7.28 (m, 5 H), 7.10-7.06 (m, 2 H), 5.31 (d, $J = 1.0$ Hz, 1 H), 3.56 (d, $J = 8.2$ Hz, 1 H), 3.40 (sept, $J = 6.7$ Hz, 1 H), 3.17 (dd, $J = 17.7, 8.3$ Hz, 1 H), 2.55 (dd, $J = 17.7, 1.0$ Hz, 1 H), 2.45 (s, 3 H), 1.35 (dd, $J = 7.2, 6.9$ Hz, 6 H); ^{13}C NMR (100 MHz CDCl_3) δ 172.3, 145.4, 141.3, 135.2, 129.5, 129.2, 128.0, 126.4, 71.2, 48.1, 37.8, 36.9, 24.6, 23.4, 21.9; IR (thin film) 2935, 2853, 1745, 1595, 1492, 1455, 1360, 1175, 1090, 960, 941, 910, 813, 735, 700 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{20}\text{H}_{24}\text{NO}_3\text{S}_2$, 390.1198 m/z ($\text{M}+\text{H}$) $^+$; observed 390.1172.

Lactam 26

5-Isopropylsulfanyl-4-phenyl-pyrrolidin-2-one (Scheme 2)

^1H NMR (400 MHz CDCl_3) δ 7.31-7.18 (m, 5 H), 6.82 (broad s, 1 H), 4.65 (d, $J = 5.1$ Hz, 1 H), 3.47-3.39 (m, 1 H), 2.95 (sept, $J = 6.7$ Hz, 1 H), 2.84 (dd, $J = 17.3, 9.2$ Hz, 1 H), 2.47 (dd, $J = 17.7, 6.7$ Hz, 1 H), 1.19 (d, $J = 6.7$ Hz, 3 H), 1.15 (d, $J = 6.7$ Hz, 3 H); ^{13}C NMR (100 MHz CDCl_3) δ 176.5, 141.4, 129.2, 127.7, 127.1, 65.9, 48.5, 38.0, 35.6, 24.1, 24.1; IR (thin film) 3300, 2926, 2896, 1760, 1595, 1446, 1371, 1166, 1067, 972, 740, 698, 658 cm^{-1} ; LRMS (ES) calculated for $\text{C}_{13}\text{H}_{17}\text{NOS}$, 236 m/z ($\text{M}+\text{H}$) $^+$; observed 236, 177, 160; HRMS (FAB) calculated for $\text{C}_{13}\text{H}_{18}\text{NOS}$, 236.1109 m/z ($\text{M}+\text{H}$) $^+$; observed 236.1122.

General Procedure for the Synthesis of Sulfilimines (synthesis of sulfilimine 5a of Table 1 as an example)

To a dry flask equipped with magnetic stir bar was added phenyl styryl sulfide (1.0 g, 4.71 mmol), MeCN 25 mL and chloramine-T trihydrate (1.7 g, 6.12 mmol). Stir at room temperature over 24 hours and sample the reaction for TLC monitoring. Upon disappearance of the sulfide, the reaction mixture was diluted with CHCl_3 and filtered through a celite plug. The filtrate was concentrated in vacuo to give a crude product, which was purified via silica gel chromatography with ethyl acetate / hexanes (75:25) to give sulfilimine **5a** (1.65 g, 92%).

Sulfilimine 5a (Table 1, entry a)

^1H NMR (500 MHz CDCl_3) δ 7.79 (d, $J = 8.2$ Hz, 2 H), 7.71-7.70 (m, 2 H), 7.55-7.48 (m, 3 H), 7.39-7.36 (m, 6 H), 7.17 (d, $J = 8.1$ Hz, 2 H), 6.60 (d, $J = 15.2$ Hz, 1 H), 2.32 (s, 3 H); ^{13}C NMR (125 MHz CDCl_3) δ 145.0, 141.9, 141.7, 135.7, 133.0, 132.6, 131.2, 130.2, 129.5, 129.3, 128.4, 127.1, 126.6, 122.9; IR (thin film) 1597, 1496, 1279, 1248, 1134, 1090, 979, 935, 807 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{21}\text{H}_{19}\text{NO}_2\text{S}_2$, 382.0935 m/z ($\text{M} + \text{H}$) $^+$; observed 382.0919.

Sulfilimine 5b (Table 1, entry b)

^1H NMR (500 MHz CDCl_3) δ 7.81 (d, J = 8.6 Hz, 2 H), 7.69-7.66 (m, 2 H), 7.54-7.38 (m, 11 H), 6.64 (d, J = 15.2 Hz, 1 H); ^{13}C NMR (125 MHz CDCl_3) δ 142.9, 141.9, 137.4, 135.0, 132.54, 132.48, 131.0, 130.1, 129.1, 128.8, 128.2, 127.8, 126.8, 122.1; IR (thin film) 3060, 1593, 1476, 1446, 1301, 1274, 1145, 1089, 968, 744, 686, 620, 569 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{20}\text{H}_{16}\text{ClN}_2\text{O}_2\text{S}_2$, 402.0389 m/z ($\text{M} + \text{H}^+$); observed 402.0367.

Sulfilimine 5c (Table 1, entry c)

^1H NMR (500 MHz CDCl_3) δ 7.83 (d, J = 8.8 Hz, 2 H), 7.69 (d, J = 8.2 Hz, 2 H), 7.50-7.33 (m, 9 H), 6.83 (d, J = 8.9 Hz, 2 H), 6.61 (d, J = 15.2 Hz, 1 H); ^{13}C NMR (125 MHz CDCl_3) δ 161.8, 141.7, 136.4, 135.5, 132.8, 132.4, 130.9, 130.1, 129.13, 129.12, 138.4, 128.2, 126.9, 122.6, 113.8; IR (thin film) 3060, 2927, 1597, 1497, 1446, 1310, 1286, 1257, 1140, 1089, 964, 833, 806, 742, 687, 577 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{21}\text{H}_{19}\text{NO}_3\text{S}_2$, 398.0885 m/z ($\text{M} + \text{H}^+$); observed 398.0906.

Sulfilimine 5f (Table 1, entry f)

^1H NMR (500 MHz CDCl_3) δ 7.78 (d, J = 8.2 Hz, 2 H), 7.56 (d, J = 8.3 Hz, 2 H), 7.35 (m, 5 H), 7.34 (d, J = 15.1 Hz, 1 H), 7.27 (d, J = 8.4 Hz, 2 H), 7.15 (d, J = 8.2 Hz, 2 H), 6.58 (d, J = 15.1 Hz, 1 H), 2.37 (s, 3 H), 2.30 (s, 3 H); ^{13}C NMR (125 MHz CDCl_3) δ 143.4, 141.7, 141.6, 141.1, 132.8, 132.1, 130.8, 130.7, 129.3, 129.1, 128.2, 127.0, 126.4, 122.8, 21.5, 21.4; IR (thin film) 3033, 2923, 2251, 1597, 1493, 1448, 1400, 1296, 1281, 1142, 1089, 1020, 970, 911, 812, 735, 657, 571, 550 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{22}\text{H}_{21}\text{NO}_2\text{S}_2$, 396.1092 m/z ($\text{M} + \text{H}^+$); observed 396.1117.

Sulfilimine 5g (Table 1, entry g)

^1H NMR (500 MHz CDCl_3) δ 7.76 (d, $J = 8.2$ Hz, 2 H), 7.63 (d, $J = 8.7$ Hz, 2 H), 7.43 (d, $J = 8.7$ Hz, 2 H), 7.38-7.35 (m, 6 H), 7.16 (d, $J = 8.1$ Hz, 2 H), 6.61 (d, $J = 15.2$ Hz, 1 H), 2.31 (s, 3 H); ^{13}C NMR (125 MHz CDCl_3) δ 142.2, 142.0, 141.4, 138.9, 134.0, 132.6, 131.2, 130.3, 129.4, 129.2, 128.3, 128.2, 126.4, 122.2, 21.5; IR (thin film) 3018, 2923, 1600, 1573, 1475, 1449, 1297, 1282, 1141, 1088, 966, 815, 747, 657, 578, 552 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{22}\text{H}_{18}\text{ClNO}_2\text{S}_2$, 416.0546 m/z ($\text{M} + \text{H}$) $^+$; observed 416.0567.

Sulfilimine 5h (Table 1, entry h)

^1H NMR (500 MHz CDCl_3) δ 7.77 (d, $J = 8.2$ Hz, 2 H), 7.61 (d, $J = 8.9$ Hz, 2 H), 7.37 (m, 5 H), 7.34 (d, $J = 15.2$ Hz, 1 H), 7.15 (d, $J = 8.1$ Hz, 2 H), 6.96 (d, $J = 8.9$ Hz, 2 H), 6.56 (d, $J = 15.1$ Hz, 1 H), 3.83 (s, 3 H), 2.32 (s, 3 H); ^{13}C NMR (125 MHz CDCl_3) δ 163.1, 141.73, 141.69, 140.7, 133.0, 130.8, 129.32, 129.30, 129.2, 128.2, 126.5, 126.1, 122.8, 115.6, 55.8, 21.5; IR (thin film) 3042, 2925, 1587, 1489, 1279, 1259, 1137, 1083, 966, 809, 746, 658 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{22}\text{H}_{21}\text{NO}_3\text{S}_2$, 412.1041 m/z ($\text{M} + \text{H}$) $^+$; observed 412.1044.

Sulfilimine 5i (Table 1, entry i)

^1H NMR (500 MHz CDCl_3) δ 7.82 (d, $J = 8.1$ Hz, 2 H), 7.39-7.36 (m, 5 H), 7.24 (d, $J = 15.0$ Hz, 1 H), 7.20 (d, $J = 8.1$ Hz, 2 H), 6.55 (d, $J = 15.3$ Hz, 1 H), 3.09-2.88 (m, 2 H), 2.33 (s, 3 H), 1.165-1.59 (m, 2 H), 1.34-1.16 (m, 6 H), 0.86 (t, $J = 7.0$ Hz, 3 H); ^{13}C NMR (125 MHz CDCl_3) δ 142.4, 142.0, 141.7, 133.1, 131.0, 129.5, 129.3, 128.2, 126.6, 121.0, 51.4, 31.4, 28.1, 23.0, 22.5, 21.6, 14.2; IR (thin film) 2925, 2856, 1450, 1279, 1141, 1083, 971, 810, 731, 658 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{21}\text{H}_{27}\text{NO}_2\text{S}_2$, 390.1561 m/z ($\text{M} + \text{H}$) $^+$; observed 390.1584.

Sulfilimine 5j (Table 1, entry j)

^1H NMR (500 MHz CDCl_3) δ 7.78 (d, J = 8.2 Hz, 2 H), 7.36-7.33 (m, 5 H), 7.16 (d, J = 8.0 Hz, 2 H), 7.13 (d, J = 15.3 Hz, 1 H), 6.50 (d, J = 15.3 Hz, 1 H), 3.04-2.98 (m, 1 H), 2.11-2.08 (m, 2 H), 2.29 (s, 3 H), 2.05-2.03 (m, 1 H), 1.95-1.93 (m, 1 H), 1.81-1.79 (m, 2 H), 1.64-1.61 (m, 1 H), 1.51-1.17 (m, 5 H); ^{13}C NMR (125 MHz CDCl_3) δ 143.0, 141.7, 141.6, 133.1, 130.7, 129.2, 129.1, 128.0, 126.4, 119.0, 105.0, 60.1, 26.8, 25.7, 25.3, 25.2, 25.1, 21.4; IR (thin film) 3030, 2926, 2854, 1597, 1446, 1275, 1140, 1084, 969, 741, 652, 569, 549 cm^{-1} .

Sulfilimine 5k (Table 1, entry k)

^1H NMR (500 MHz CDCl_3) δ 7.79 (d, J = 8.2 Hz, 2 H), 7.40-7.34 (m, 5 H), 7.19 (d, J = 15.3 Hz, 1 H), 7.17 (d, J = 8.0 Hz, 2 H), 6.46 (d, J = 15.2 Hz, 1 H), 2.31 (s, 3 H), 1.32 (s, 9 H); ^{13}C NMR (125 MHz CDCl_3) δ 143.5, 141.5, 133.5, 130.7, 129.8, 129.19, 129.16, 128.0, 126.6, 117.5, 58.7, 24.1, 21.4; IR (KBr) 3012, 1288, 1275, 1133, 1080, 966 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{19}\text{H}_{23}\text{NO}_2\text{S}_2$, 362.1170 m/z ($\text{M}+\text{H}$) $^+$; observed 362.1133.

Sulfilimine 5l (Table 1, entry l)

^1H NMR (500 MHz CDCl_3) δ 7.63 (d, J = 8.2 Hz, 2 H), 7.35-7.18 (m, 10 H), 7.07 (d, J = 14.9 Hz, 1 H), 7.06 (d, J = 8.8 Hz, 2 H), 6.48 (d, J = 15.3 Hz, 1 H), 4.28 (d, J = 12.5 Hz, 1 H), 4.19 (d, J = 12.5 Hz, 1 H), 2.27 (s, 3 H); ^{13}C NMR (125 MHz CDCl_3) δ 142.7, 141.7, 141.5, 133.0, 130.9, 129.5, 129.4, 129.25, 129.19, 128.1, 127.8, 126.4, 120.0, 58.1, 21.5; IR (KBr) 3027, 2977, 1280, 1137, 1085, 959, 897, 822, 743, 703, 650, 570, 550 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{22}\text{H}_{21}\text{NO}_2\text{S}_2$, 396.1092 m/z ($\text{M}+\text{H}$) $^+$; observed 396.1096.

Sulfilimine 8 (Table 2, entry 1)

^1H NMR (500 MHz CDCl_3) δ 7.74 (d, $J = 8.2$ Hz, 2 H), 7.19 (d, $J = 8.2$ Hz, 2 H), 6.42 (dt, $J = 14.9, 7.0$ Hz, 1 H), 5.89 (d, $J = 15.2$ Hz, 1 H), 2.89-2.85 (m, 1 H), 2.36 (s, 3 H), 2.16-2.12 (m, 2 H), 2.04-2.02 (m, 1 H), 1.90-1.79 (m, 2 H), 1.65-1.63 (m, 1 H), 1.42-1.19 (m, 10 H), 0.87 (t, $J = 7.2$ Hz, 3 H); ^{13}C NMR (125 MHz CDCl_3) δ 148.1, 141.9, 141.5, 129.2, 126.5, 121.2, 59.4, 32.3, 30.0, 26.6, 25.8, 25.3, 25.2, 25.0, 22.2, 21.5, 13.9; IR (thin film) 2925, 2860, 1735, 1452, 1279, 1142, 1088, 976, 814, 731, 653 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{19}\text{H}_{29}\text{NO}_2\text{S}_2$, 368.1718 m/z ($\text{M} + \text{H}$) $^+$; observed 368.1725.

Sulfilimine 10 (Table 2, entry 2)

^1H NMR (500 MHz CDCl_3) δ 7.72 (d, $J = 8.2$ Hz, 2 H), 7.17 (d, $J = 8.0$ Hz, 2 H), 6.56 (dt, $J = 14.5, 2.9$ Hz, 1 H), 6.16 (dt, $J = 14.5, 2.2$ Hz, 1 H), 4.22 (t, $J = 2.7$ Hz, 2 H), 2.87-2.80 (m, 1 H), 2.34 (s, 3 H), 2.01-1.15 (m, 10 H), 0.86 (s, 9 H), 0.01 (s, 6 H); ^{13}C NMR (125 MHz CDCl_3) δ 145.2, 142.2, 141.3, 129.1, 126.5, 120.2, 77.6, 62.3, 60.0, 26.7, 25.9, 25.7, 25.3, 25.1, 21.4, 18.3, -5.0; IR (thin film) 2930, 2857, 1599, 1453, 1296, 1281, 1142, 1089, 964, 838, 814, 657 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{22}\text{H}_{37}\text{NO}_3\text{S}_2\text{Si}$, 456.2062 m/z ($\text{M} + \text{H}$) $^+$; observed 456.2055.

Sulfilimine 12 (Table 2, entry 3)

^1H NMR (500 MHz CDCl_3) δ 7.67 (d, $J = 8.2$ Hz, 2 H), 7.15 (d, $J = 8.1$ Hz, 2 H), 6.47 (dt, $J = 14.8, 4.3$ Hz, 1 H), 6.13 (app triplet, $J = 15.5, 14.9$ Hz, 1 H), 4.59 (d, $J = 2.8$ Hz, 2H), 2.87-2.80 (m, 1 H), 2.31 (s, 3 H), 2.02 (s, 3 H), 1.86-1.13 (m, 10 H); ^{13}C NMR (125 MHz CDCl_3) δ 170.0, 141.6, 141.3, 138.7, 129.1, 126.2, 122.3, 62.2, 59.3, 26.6, 26.3, 25.8, 25.1, 24.9, 24.87, 21.4; IR (thin film) 2935, 2858, 1747, 1451, 1280, 1229, 1143, 1089, 973, 915, 733, 656 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{18}\text{H}_{25}\text{NO}_4\text{S}_2$, 384.1225 m/z ($\text{M} + \text{H}$) $^+$; observed 384.1266.

Sulfilimine 14 (Table 2, entry 4)

^1H NMR (500 MHz CDCl_3) δ 7.71 (d, $J = 8.2$ Hz, 2 H), 7.17 (d, $J = 8.0$ Hz, 2 H), 6.43 (dt, $J = 15.0, 5.7$ Hz, 1 H), 6.13 (dt, $J = 15.0, 2.5$ Hz, 1 H), 3.61 (t, $J = 4.6$ Hz, 4 H), 3.03 (dd, $J = 5.6, 2.5$ Hz, 2 H), 2.90-2.83 (m, 1 H), 2.33 (s, 3 H), 2.27 (t, $J = 4.6$ Hz, 4 H), 1.98-1.15 (m, 10 H); ^{13}C NMR (125 MHz CDCl_3) δ 142.9, 142.1, 141.3, 129.0, 126.4, 123.7, 66.8, 59.6, 59.1, 53.5, 26.7, 25.6, 25.1, 24.9, 21.3, 14.1; IR (thin film) 2933, 2856, 2811, 1453, 1349, 1296, 1280, 1143, 1117, 1089, 972, 867, 816, 734, 657, 575, 552 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{20}\text{H}_{30}\text{N}_2\text{O}_3\text{S}_2$, 411.1776 m/z ($\text{M} + \text{H}$) $^+$; observed 411.1793.

Sulfilimine 16 (Table 2, entry 5)

^1H NMR (500 MHz CDCl_3) δ 7.66 (d, $J = 8.2$ Hz, 2 H), 7.36-7.29 (m, 5 H), 7.13 (d, $J = 10.4$ Hz, 1 H), 7.06 (d, $J = 8.1$ Hz, 2 H), 6.10 (d, $J = 10.4$ Hz, 1 H), 3.01-2.95 (m, 1 H), 2.29 (s, 3 H), 2.15-2.12 (m, 1 H), 1.90-1.87 (m, 1 H), 1.80-1.76 (m, 1 H), 1.69-1.67 (m, 1 H), 1.61-1.58 (m, 1 H), 1.34-1.17 (m, 4 H); ^{13}C NMR (125 MHz CDCl_3) δ 143.4, 141.6, 141.4, 132.8, 130.0, 129.5, 129.1, 128.8, 126.4, 123.3, 60.7, 26.4, 26.1, 25.2, 25.1, 24.9, 21.4; IR (thin film) 3029, 2927, 2855, 1598, 1491, 1445, 1281, 1137, 1086, 958, 779, 686, 651 cm^{-1} .

Sulfilimine 18 (Table 2, entry 6)

^1H NMR (500 MHz CDCl_3) δ 7.74 (d, $J = 8.2$ Hz, 2 H), 7.18 (d, $J = 8.4$ Hz, 2 H), 6.27 (dt, $J = 9.3, 7.8$ Hz, 1 H), 5.93 (d, $J = 9.3$ Hz, 1 H), 2.95-2.87 (m, 1 H), 2.35 (s, 3 H), 2.22-1.18 (m, 16 H), 0.85 (t, $J = 6.6$ Hz, 3 H); ^{13}C NMR (125 MHz CDCl_3) δ 147.8, 142.0, 141.4, 129.1, 126.5, 123.7, 59.8, 30.6, 29.9, 29.8, 26.3, 25.3, 25.1, 24.8, 22.2, 21.5, 13.9; IR (thin film) 2929, 2856, 1452, 1281, 1142, 1089, 965 cm^{-1} .

Sulfilimine 20 (Table 2, entry 7)

^1H NMR (500 MHz CDCl_3) δ 7.74 (d, $J = 8.2$ Hz, 2 H), 7.17 (d, $J = 8.1$ Hz, 2 H), 5.70 (s, 1 H), 2.90-2.88 (m, 1 H), 2.36 (s, 3 H), 2.25-2.10 (m, 3 H), 1.86-1.62 (m, 7 H), 1.40-1.21 (m, 9 H), 0.86 (t, $J = 7.0$ Hz, 3 H); ^{13}C NMR (125 MHz CDCl_3) δ 158.6, 142.1, 141.3, 129.1, 126.6, 118.5, 59.8, 34.3, 29.9, 26.5, 26.4, 25.3, 25.2, 24.9, 23.4, 22.6, 21.5, 14.0; IR (thin film) 2931, 2858, 1452, 1294, 1280, 1141, 1089, 966, 815, 755, 654 cm^{-1} ; HRMS (FAB) calculated for $\text{C}_{20}\text{H}_{31}\text{NO}_2\text{S}_2$, 382.1874 m/z ($\text{M} + \text{H}$) $^+$; observed 382.1855.

Sulfilimine 22 (Table 2, entry 8)

^1H NMR (500 MHz CDCl_3) δ 7.72 (d, $J = 8.2$ Hz, 2 H), 7.19 (d, $J = 8.0$ Hz, 2 H), 6.40-6.39 (m, 1 H), 2.98-2.94 (m, 1 H), 2.45-2.41 (m, 1 H), 2.36 (s, 3 H), 2.17-1.21 (m, 17 H); ^{13}C NMR (125 MHz CDCl_3) δ 141.9, 141.3, 141.2, 131.7, 129.1, 126.5, 54.9, 27.1, 26.4, 26.0, 25.3, 25.1, 24.8, 22.1, 21.5, 21.46, 20.6; IR (thin film) 2932, 2858, 1450, 1281, 1142, 1089, 969, 815, 762, 734; HRMS (FAB) calculated for $\text{C}_{19}\text{H}_{27}\text{NO}_2\text{S}_2$, 366.1561 m/z ($\text{M} + \text{H}$) $^+$; observed 366.1570.

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