Supporting Information for:

Easy access to new heterocyclic systems: 1,4-oxazine and substituted-1,4-oxazines

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Experimental details

THF was distilled from sodium/benzophenone ketyl immediately prior use. Dichloromethane was distilled over CaH_2 and methanol from magnesium turnings. The reactions were monitored by thin-layer chromatography (TLC) analysis using silica gel (60 F₂₅₄) plates. Compounds were visualized by UV irradiation and/or spraying with a solution of potassium permanganate, followed by charring at 150 °C. Column chromatography was performed on silica gel 60 (230-400 mesh, 0.040-0.063 mm). Melting points (mp [°C]) were taken on samples in open capillary tubes and are uncorrected. The infrared spectra of compounds were recorded on an Infrared Fourier Transform spectrophotometer using NaCl plates or KBr pellets. ^1H and ^{13}C NMR spectra were recorded on a spectrometer at 250 MHz (^{13}C , 62.9 MHz). Chemical shifts are given in parts per million from tetramethylsilane (TMS) as internal standard. Ion spray or electronic impact methodology were used to record mass spectra. Nomenclature of the obtained compounds follows the rules of IUPAC and was checked with AutoNom.¹ Petroleum ether (P.E.) had a boiling point range 40–60 °C.

4-(*tert*-butoxycarbonyl)-morpholine-3,5-dione (2). A solution of 3,5-dioxomorpholine **1**² (0.510 g, 4.43 mmol), di-*tert*-butyl dicarbonate (1.451 g, 6.65 mmol) and DMAP (0.054 g, 0.04 mmol) in acetonitrile (13 mL) was stirred at room temperature, under argon, for 1 h. After concentration, the residue was diluted in EtOAc. The organic phase was washed with brine, dried over anhydrous MgSO_4 and concentrated. The residue was diluted in a minimum of AcOEt. The addition of petroleum ether results in the formation of a precipitate, which is filtered through a filter paper. After concentration of the filtrate, a flash chromatography (petroleum ether:EtOAc, 7:3) afforded **2**

1. ACD-Chem Sketch; <http://www.acdlabs.com>

2. (a) Klose, J. Reese, C.B.; Song, Q. *Tetrahedron* **1997**, 53, 14411. (b) Wolfe, J.F.; Rogers, T.G. *J. Org. Chem.* **1970**, 35, 3600.

(0.779 g, 82%) as a pale yellow solid; mp 117°C; IR (KBr) 2984, 1792, 1718, 1373, 1252, 1140 cm⁻¹; ¹H NMR (CDCl₃) δ 4.35 (s, 4 H), 1.59 (s, 9 H); ¹³C NMR (CDCl₃) δ 166.6 (s), 152.9 (s), 87.5 (s), 67.3 (t), 27.6 (q). HRMS (TOF ES+) m/z [M+Na+CH₃OH]⁺ calcd for C₁₀H₁₇NO₆²³Na : 270.0954 ; found 270.0953.

4-(*tert*-butoxycarbonyl)-3,5-di-(1,4-benzodioxin-2-yl)-[1,4]-oxazine

(4b). Compound **4b** was prepared according to the general procedure (A) reported for **4a** starting from bis-vinylphosphate **3** (0.080 g, 0.12

mmol) and tributyl(benzodioxin)tin (0.249 g, 0.59 mmol). Flash chromatography (petroleum ether:EtOAc, 9:1) afforded **4b** (0.046 g, 87 %) as a yellow solid; mp 140°C; IR (KBr) 2984, 1723, 1684, 1598, 1495, 1251 cm⁻¹; ¹H NMR (CDCl₃) δ 6.87 (s, 2 H), 6.74-6.78 (m, 4 H), 6.59-6.65 (m, 4 H), 6.01 (s, 2 H), 1.40 (s, 9 H); ¹³C NMR (CDCl₃) δ 153.9 (s), 142.2 (s), 142.1 (s), 139.1 (d), 131.8 (s), 125.9 (s), 124.3 (d), 124.2 (d), 123.9 (d), 118.1 (s), 116.4 (d), 83.0 (s), 28.1 (q). HRMS (EI) m/z [M]⁺ calcd for C₂₅H₂₁NO₇ : 447.1318; found 447.1302.

4-(*tert*-butoxycarbonyl)-3,5-diphenylethynyl-[1,4]-oxazine (4c).

Compound **4c** was prepared according to the general procedure (A)

reported for **4a** starting from bis-vinylphosphate **3** (0.557 g, 0.82 mmol) and trimethyl(phenylethynyl)tin (1.085 g, 4.10 mmol). Flash chromatography (petroleum ether:EtOAc, 95:5) afforded **4c** (0.285 g, 91%) as a yellow oil; IR (NaCl) 2979, 2203, 1722, 1489 cm⁻¹; ¹H NMR (CDCl₃) δ 7.49-7.45 (m, 4 H), 7.33-7.26 (m, 6 H), 6.67 (s, 2 H), 1.54 (s, 9 H); ¹³C NMR (CDCl₃) δ 153.5 (s), 143.1 (s), 131.4 (d), 128.4 (d), 128.2 (d), 122.6 (d), 109.5 (s), 90.2 (s), 82.4 (s), 81.3 (s), 28.2 (q). HRMS (TOF ES+) m/z [M+Na]⁺ calcd for C₂₅H₂₁NO₃²³Na : 406.1419; found 406.1462.

General procedure (B) for Suzuki-Miyaura-type coupling reactions. 4-(*tert*-butoxycarbonyl)-3,5-diphenyl-[1,4]-oxazine (4d**).**

To a solution of bis-vinylphosphate **3** (0.240 g, 0.35 mmol) in THF (2.5 mL) under argon PdCl₂(PPh₃)₂ (0.025 g, 0.04 mmol) was added. The flask was evacuated and backfilled with argon three times, and the mixture was stirred during 15 min. Then, phenylboronic acid (0.215 g, 1.77 mmol), Ba(OH)₂·8H₂O (0.334 g, 1.06 mmol), H₂O (0.7 mL) and a few drops of EtOH were added. The mixture was refluxed during 1 h. After cooling, the reaction mixture was filtered through Celite, and was washed with EtOAc. The organic phase was washed with brine, dried over anhydrous MgSO₄ and concentrated. Flash chromatography (petroleum ether:EtOAc, 9:1) afforded **4d** (0.101 g, 86%) as white crystals; mp 125°C; IR (KBr) 3088, 2977, 1718, 1653, 1306, 1122 cm⁻¹; ¹H NMR (CDCl₃) δ 7.25-7.48 (m, 10H), 6.76 (s, 2 H), 1.09 (s, 9 H); ¹³C NMR (CDCl₃) δ 153.5 (s), 137.7 (s), 134.9 (s), 128.6 (d), 127.4 (d), 126.7 (s), 126.0 (s), 124.4 (d), 81.7 (s), 27.7 (q). HRMS (EI) m/z [M]⁺• calcd for C₂₁H₂₁NO₃ : 335.1521; found 335.1534.

4-(*tert*-butoxycarbonyl)-3,5-dithianaphten-2-yl-[1,4]-oxazine (4e**).**

Compound **4e** was prepared according to the general procedure (B) reported for **4d** starting from bis-vinylphosphate **3** (0.200 g, 0.29 mmol) and thianaphtene-2-boronic acid (0.262 g, 1.47 mmol). Flash chromatography (petroleum ether:EtOAc, 9:1) afforded **4e** (0.090 g, 68%) as a white solid; mp 182°C; IR (KBr) 2973, 1722, 1609, 1319, 1295, 1165 cm⁻¹; ¹H NMR (CDCl₃) δ 7.63-7.70 (m, 4 H), 7.20-7.28 (m, 6 H), 6.95 (s, 2 H), 1.16 (s, 9 H); ¹³C NMR (CDCl₃) δ 153.4 (s), 139.7(s), 139.0(s), 138.5(s), 137.0(d), 124.4(d), 123.3(d), 122.1(d), 122.0 (d), 119.9 (d), 82.6 (s), 27.8 (q). HRMS (TOF ES+) m/z [M+Na]⁺ calcd for C₂₅H₂₁NO₃²³NaS₂ : 470.0861; found 470.0906.

4-(*tert*-butoxycarbonyl)-3,5-dibenzofuran-2-yl-[1,4]-oxazine (4f).

Compound **4f** was prepared according to the general procedure (B) reported for **4d** starting from bis-vinylphosphate **3** (0.150 g, 0.22 mmol) and 2-benzofuranboronic acid (0.176 g, 1.10 mmol). Flash chromatography (petroleum ether:EtOAc, 95:5) afforded **4f** (0.089 g, 97%) as a white solid; mp 190°C; IR (KBr) 2975, 1728, 1452, 1303, 1286, 1158 cm⁻¹; ¹H NMR (CDCl₃) δ 7.52-7.56 (m, 2 H), 7.40-7.42 (m, 2 H), 7.36 (s, 2 H), 7.16-7.30 (m, 4 H), 6.76 (s, 2 H), 1.34 (s, 9 H); ¹³C NMR (CDCl₃) δ 154.3 (s), 153.7 (s), 149.9 (s), 140.2 (d), 128.5 (s), 124.4 (d), 122.9 (d), 120.7 (d), 118.3 (s), 110.8 (d), 103.3 (d), 82.7 (s), 27.9 (q). HRMS (TOF ES+) m/z [M+Na]⁺ calcd for C₂₅H₂₁NO₅²³Na : 438.1317; found 438.1312.

4-(*tert*-butoxycarbonyl)-3,5-dithien-2-yl-[1,4]-oxazine (4g). Compound

4g was prepared according to the general procedure (B) reported for **4d** starting from bis-vinylphosphate **3** (0.130 g, 0.19 mmol) and 2-thienylboronic acid (0.121 g, 0.96 mmol). Flash chromatography (petroleum ether:EtOAc, 98:2) afforded **4g** (0.059 g, 89%) as a white solid; mp 100°C; IR (KBr) 2973, 1718, 1301, 1159 cm⁻¹; ¹H NMR (CDCl₃) δ 7.10-7.25 (m, 4 H), 6.99 (m, 2 H), 6.91 (s, 2 H), 1.26 (s, 9 H); ¹³C NMR (CDCl₃) δ 153.3 (s), 137.7 (d), 137.2 (s), 127.0 (d), 123.6 (d), 123.3 (d), 122.1 (s), 82.1 (s), 27.7 (q). HRMS (TOF ES+) m/z [M+Na]⁺ calcd for C₁₇H₁₇NO₃²³NaS₂ : 370.0548; found 370.0565.

4-(*tert*-butoxycarbonyl)-[1,4]-oxazine (5). To a solution of bis-vinylphosphate **3** (3.235 g, 4.76 mmol) in DME (20 mL), under argon, Pd(OAc)₂ (0.009 g, 0.38 mmol) and PPh₃ (0.200 g, 0.76 mmol) were added. The flask was evacuated and

backfilled with argon three times, and the mixture was stirred during 5 min at room temperature. Then, this solution was cannulated dropwise, under argon, into a degazed solution of formic acid (0.876 g, 19.04 mmol) and triethylamine (2.890 g, 28.56 mmol) in DME (20 mL). The mixture was refluxed during 40 min at 85°C. After cooling, the reaction mixture was filtered through Celite, and was washed with EtOAc. The organic phase was washed with brine, dried over anhydrous MgSO₄ and concentrated. Flash chromatography (petroleum ether) afforded **5** (0.611 g, 70%) as a colorless oil; IR (KBr) 2983, 1700, 1684, 1653 cm⁻¹; ¹H NMR (CDCl₃) δ 5.97 (dd, *J* = 1.6 and 4.7 Hz, 1 H), 5.82 (dd, *J* = 1.9 and 5.3 Hz, 1 H), 5.60 (d, *J* = 5.0 Hz, 1 H), 5.47 (d, *J* = 5.0 Hz, 1 H), 1.47 (s, 9 H); ¹³C NMR (CDCl₃) δ 148.2 (*s*), 130.3 (*d*), 128.9 (*d*), 109.3 (*d*), 108.7 (*d*), 81.6 (*s*), 28.4 (*q*). HRMS (EI) *m/z* [M]⁺• calcd for C₉H₁₃NO₃ : 183.0895; found 183.0913.

4-(*tert*-butoxycarbonyl)-3,5-diphenyl-2-tributylstannanyl-[1,4]-oxazine

(6a). A solution of 4-(*tert*-butoxycarbonyl)-3,5-diphenyl-[1,4]-oxazine **4d**

(0.150 g, 0.45 mmol) in THF (11 mL) was cooled to -78°C under argon. Subsequently, *n*-butyllithium (0.419 mL, 1.6 M in hexane, 0.67 mmol) was added dropwise. After stirring for 45 min at -78°C, a solution of tributyltin chloride (0.436 g, 1.34 mmol) in THF (1 mL), previously dried over molecular sieves (4 Å), was added dropwise. After 1 h at -78°C, the reaction was quenched by slow addition of a saturated aqueous solution of KF. After filtration of the white precipitate through Celite, the aqueous phase was extracted with EtOAc and the organic phase was washed with brine. The organic phase was dried over anhydrous MgSO₄ and concentrated. Flash chromatography (pentane:EtOAc, 9:1) afforded **6a** (0.196 g, 70%) as a pale yellow oil; IR (NaCl) 3059, 2966, 2936, 2862, 1734, 1610, 1446, 1322 cm⁻¹; ¹H NMR (CDCl₃) δ 7.21-7.45 (m, 10 H), 6.77 (s, 1 H), 1.31-1.41 (m, 6 H), 1.17-1.26 (m, 6 H), 1.06 (s, 9 H), 0.76-0.86 (m, 15 H); ¹³C NMR (CDCl₃) δ 157.3 (*s*), 151.8 (*s*), 138.9 (*d*), 137.9 (*s*),

136.4 (s), 135.2 (s), 128.5 (d), 128.3 (d), 127.7 (d), 127.5 (d), 127.0 (d), 124.2 (d), 81.1 (s), 28.9 (t), 27.8 (q), 27.3 (t), 13.7 (q), 11.1 (t). HRMS (TOF ES+) m/z $[M+Na]^+$ calcd for $C_{33}H_{47}NO_3^{23}Na^{120}Sn$: 648.2475; found 648.2490.

4-(*tert*-butoxycarbonyl)-3,5-diphenyl-2-[hydroxy-(3,4,5-trimethoxyphenyl)-methyl]-[1,4]-oxazine (6c).

A solution of 4-(*tert*-butoxycarbonyl)-3,5-diphenyl-[1,4]-oxazine **4d** (0.100 g, 0.30 mmol) in THF (7 mL) was cooled to -78°C under argon. Subsequently, *n*-butyllithium (0.280 mL, 1.6 M in hexane, 0.45 mmol) was added dropwise. After stirring for 45 min at -78°C , a solution of trimethoxybenzaldehyde (0.175 g, 0.89 mmol) in THF (1 mL), previously dried over molecular sieves (4 Å), was added dropwise. After 1 h at -78°C , the reaction was quenched by slow addition of water. The aqueous phase was then extracted with EtOAc and the organic phase was washed with brine. The organic phase was dried over anhydrous MgSO_4 and concentrated. Flash chromatography (petroleum ether:EtOAc:toluene, 5:3:2) afforded **6c** (0.125 g, 79%) as a white solid; mp $153\text{--}154^{\circ}\text{C}$; IR (KBr) 3447, 2988, 2950, 1719, 1592, 1507, 1461, 1127 cm^{-1} ; ^1H NMR (CDCl_3) δ 7.31–7.47 (m, 10 H), 6.82 (s, 1 H), 6.71 (s, 2 H), 5.51 (s, 1 H), 3.85 (s, 3 H), 3.83 (s, 6 H), 1.07 (s, 9 H); ^{13}C NMR (CDCl_3) δ 153.5 (s), 152.6 (s), 147.4 (s), 138.2 (d), 136.2 (s), 135.5 (s), 134.2 (s), 128.7 (d), 128.6 (d), 128.2 (d), 128.1 (d), 127.7 (d), 126.0 (s), 124.9 (s), 124.4 (d), 103.4 (d), 81.9 (s), 70.0 (s), 61.0 (q), 56.2 (q), 27.8 (q). Anal. calcd for $C_{31}H_{33}NO_7$: C, 70.04%; H, 6.26%; N, 2.63%. Found: C, 70.32%; H, 6.16%; N, 2.64%.

4-(*tert*-butoxycarbonyl)-3,5-diphenyl-2-(furan-2-yl-hydroxy-methyl)-[1,4]-oxazine (6d).

Compound **6d** was prepared according to the procedure reported for **6b** starting from 4-(*tert*-butoxycarbonyl)-3,5-diphenyl-[1,4]-oxazine **4d** (0.100 g,

0.30 mmol) and furfural (0.143 g, 1.49 mmol). Flash chromatography (petroleum ether:EtOAc, 8:2) afforded **6d** (0.089 g, 78%) as a white solid; mp 179-180°C; IR (KBr) 3452, 2972, 1718, 1639, 1348, 1157, 1105 cm⁻¹; ¹H NMR (CDCl₃) δ 7.20-7.46 (m, 11 H), 6.83 (s, 1 H), 6.36-6.42 (m, 2 H), 5.50 (d, *J* = 5.0 Hz, 1 H), 2.71 (d, *J* = 6.7 Hz, 1 H), 1.04 (s, 9 H); ¹³C NMR (CDCl₃) δ 153.1 (*s*), 152.3 (*s*), 145.7 (*s*), 142.8 (*d*), 138.0 (*d*), 135.2 (*s*), 134.3 (*s*), 128.6 (*d*), 128.5 (*d*), 128.2 (*d*), 128.1 (*d*), 127.6 (*d*), 125.1 (*s*), 124.4 (*d*), 110.6 (*d*), 107.7 (*d*), 81.8 (*s*), 64.7 (*d*), 27.8 (*q*). HRMS (TOF ES⁺) *m/z* [M+Na]⁺ calcd for C₂₆H₂₅NO₅²³Na : 454.1630; found 454.1630.

4-(*tert*-butoxycarbonyl)-3,5-diphenyl-2-formyl-[1,4]-oxazine (6e**).** Compound **6e** was prepared according to the procedure reported for **6b** starting from 4-

(*tert*-butoxycarbonyl)-3,5-diphenyl-[1,4]-oxazine **4d** (0.190 g, 0.57 mmol) and DMF (0.207 g, 2.83mmol). Flash chromatography (petroleum ether:EtOAc, 8:2) afforded **6e** (0.197 g, 96%) as a yellow solid; mp 159-160°C; IR (KBr) 2977, 2866, 1727, 1675, 1605, 1368, 1337, 1228 cm⁻¹; ¹H NMR (CDCl₃) δ 9.38 (s, 1 H), 7.34-7.58 (m, 10 H), 6.77 (s, 1 H), 1.04 (s, 9 H); ¹³C NMR (CDCl₃) δ 184.1 (*d*), 150.8 (*s*), 144.4 (*s*), 143.6 (*s*), 137.9 (*d*), 133.7 (*s*), 132.7 (*s*), 130.1 (*d*), 129.3 (*d*), 128.8 (*d*), 128.7 (*d*), 127.9 (*d*), 127.6 (*s*), 124.5 (*d*), 83.2 (*s*), 27.6 (*q*). Anal. calcd for C₂₂H₂₁NO₄: C, 72.71%; H, 5.82%; N, 3.85%. Found: C, 72.91%; H, 5.79%; N, 3.82%.

4-(*tert*-butoxycarbonyl)-3,5-diphenyl-2-methoxycarbonyl-[1,4]-oxazine (6f**).** Compound **6f** was prepared according to the procedure reported for **6b**

starting from 4-(*tert*-butoxycarbonyl)-3,5-diphenyl-[1,4]-oxazine **4d** (0.070 g, 0.21 mmol) and methyl cyanoformate (0.089 g, 1.04 mmol). Flash chromatography (petroleum ether:EtOAc, 9:1) afforded **6f** (0.053 g, 64%) as a colorless oil; IR (NaCl) 2992, 1723, 1630, 1346, 1158,

1120, 1110 cm^{-1} ; ^1H NMR (CDCl_3) δ 7.25-7.58 (m, 10 H), 6.87 (s, 1 H), 3.67 (s, 3 H), 1.06 (s, 9 H); ^{13}C NMR (CDCl_3) δ 161.7 (s), 151.6 (s), 138.3 (d), 137.6 (s), 135.8 (s), 134.4 (s), 133.5 (s), 129.1 (d), 128.8 (d), 128.7 (d), 128.3 (s), 127.8 (d), 127.7 (d), 124.4 (d), 82.5 (s), 52.2 (q), 27.7 (q). HRMS (TOF ES+) m/z $[\text{M}+\text{Na}]^+$ calcd for $\text{C}_{23}\text{H}_{23}\text{NO}_5^{23}\text{Na}$: 416.4333; found 416.4364.

4-(*tert*-butoxycarbonyl)-2-(3,4-dimethoxy-benzoyl)-3,5-diphenyl-[1,4]-oxazine (6g). Compound **6g** was prepared according to the

procedure reported for **6b** starting from 4-(*tert*-butoxycarbonyl)-3,5-diphenyl-[1,4]-oxazine **4d** (0.100 g, 0.30 mmol) and N,3,4-trimethoxy-N-methylbenzamide (0.336 g, 1.49 mmol). Flash chromatography (petroleum ether:EtOAc, 8:2) afforded **6g** (0.113 g, 76%) as a yellow oil; IR (NaCl) 3416, 2980, 1734, 1596, 1515, 1271, 1149, 1022 cm^{-1} ; ^1H NMR (CDCl_3) δ 7.23-7.52 (m, 11 H), 6.90 (s, 1 H), 6.76 (d, $J = 8.5$ Hz, 1 H), 3.89 (s, 3 H), 3.87 (s, 3 H), 1.08 (s, 9 H); ^{13}C NMR (CDCl_3) δ 187.2 (s), 154.0 (s), 152.2 (s), 149.2 (s), 144.1 (s), 138.1 (d), 134.4 (s), 134.0 (s), 130.1 (s), 128.7 (d), 128.6 (s), 128.4 (d), 128.3 (d), 127.8 (d), 126.0 (s), 125.6 (d), 124.5 (d), 111.3 (d), 110.1 (d), 82.3 (s), 56.2 (q), 56.1 (q), 27.7 (q). HRMS (ESI) m/z $[\text{M}+\text{Na}]^+$ calcd for $\text{C}_{30}\text{H}_{29}\text{NO}_6^{23}\text{Na}$: 522.18926; found 522.1885.

2-benzyl-4-(*tert*-butoxycarbonyl)-3,5-diphenyl-[1,4]-oxazine (6h).

Compound **6h** was prepared according to the procedure reported for **6b** starting from 4-(*tert*-butoxycarbonyl)-3,5-diphenyl-[1,4]-oxazine **4d** (0.100 g, 0.30 mmol) and benzyl bromide (0.255 g, 1.49 mmol). Flash chromatography (petroleum ether:EtOAc, 95:5) afforded **6h** (0.068 g, 54%) as a colorless oil; IR (NaCl) 2984, 1717, 1158 cm^{-1} ; ^1H NMR (CDCl_3) δ 7.18-7.50 (m, 15 H), 6.73 (s, 1 H), 3.68 (s, 2 H), 1.07 (s, 9 H); ^{13}C NMR (CDCl_3) δ 152.7 (s), 147.9 (s), 138.0 (s), 137.7 (d), 137.5 (s), 136.6 (s), 134.6 (s), 128.6 (d), 128.5 (d), 128.4 (d),

128.3 (d), 127.9 (d), 127.6 (d), 127.5 (d), 127.4 (d), 127.3 (d), 126.7 (d), 124.4 (d), 124.3 (d), 122.9 (s), 81.4 (s), 35.8 (t), 27.8 (q). HRMS (EI) m/z $[M]^+\bullet$ calcd for $C_{28}H_{27}NO_3$: 425.19909; found 425.1986.

4-(*tert*-butoxycarbonyl)-3,5-diphenyl-2-iodo-[1,4]-oxazine (6i). Compound **6i**

was prepared according to the procedure reported for **6b** starting from 4-(*tert*-butoxycarbonyl)-3,5-diphenyl-[1,4]-oxazine **4d** (0.154 g, 0.46 mmol) and iodine (0.583 g, 2.30 mmol). Flash chromatography (petroleum ether:EtOAc, 9:1) afforded **6i** (0.201 g, 95%) as a beige solid; mp 147-148°C; IR (KBr) 2990, 1704, 1319 cm^{-1} ; 1H NMR ($CDCl_3$) δ 7.67-7.63 (m, 2 H), 7.46-7.30 (m, 8 H), 6.77 (s, 1H), 1.06 (s, 9 H); ^{13}C NMR ($CDCl_3$) δ 151.4 (s), 137.9 (d), 136.1 (s), 133.5 (s), 129.5 (s), 128.9 (d), 128.7 (d), 128.2 (d), 128.1 (d), 128.0 (d), 124.8 (d), 82.3 (s), 27.6 (q). Anal. calcd for $C_{21}H_{20}INO_3$: C, 54.68%; H, 3.04%; N, 3.04%. Found: C, 54.76%; H, 3.16%; N, 3.01%.

3,5-Bis-benzofuran-2-yl-4-(*tert*-butoxycarbonyl)-2-[hydroxy-(3,4,5-trimethoxy-phenyl)-methyl]-[1,4]-oxazine (6j). Compound

6j was prepared according to the procedure reported for **6a** starting from 4-(*tert*-butoxycarbonyl)-3,5-dibenzofuran-2-yl-[1,4]-oxazine **4f** (0.095 g, 0.23 mmol) and trimethoxybenzaldehyde (0.224 g, 1.14 mmol). Flash chromatography (petroleum ether:EtOAc, 8:2) afforded **6j** (0.066 g, 47%) as a yellow foam; IR (KBr) 3445, 1724 cm^{-1} ; 1H NMR ($CDCl_3$) δ 7.59-7.54 (m, 2 H), 7.48-7.38 (m, 3 H), 7.29-7.20 (m, 4 H), 6.89 (s, 1 H), 6.83 (s, 2 H), 6.80 (s, 1 H), 6.35 (s, 1 H), 3.85 (s, 3 H), 3.83 (s, 6 H), 1.27 (s, 9 H); ^{13}C NMR ($CDCl_3$) δ 154.7 (s), 154.6 (s), 153.8 (s), 153.5 (s), 152.0 (s), 150.0 (s), 149.7 (s), 140.6 (d), 137.6 (s), 135.4 (s), 128.6 (s), 128.3 (s), 124.9 (d), 124.7 (d), 123.4 (d), 123.1 (d), 121.2 (d), 121.0 (d), 119.7 (s), 115.2 (s), 111.0 (d), 105.8 (d), 103.9 (d),

103.1 (*d*), 82.8 (*s*), 69.2 (*d*), 60.9 (*q*), 56.2 (*q*), 28.0 (*q*). HRMS (TOF ES+) m/z $[M+Na]^+$ calcd for $C_{35}H_{33}NO_9^{23}Na$: 634.2053; found 634.2063.

3,5-Bis-phenylethynyl-4-(*tert*-butoxycarbonyl)-2-[hydroxy-(3,4,5-trimethoxy-phenyl)-methyl]-[1,4]-oxazine (6k). A solution of 4-(*tert*-butoxycarbonyl)-3,5-diphenylethynyl-[1,4]-oxazine **4c** (0.155 g, 0.40 mmol) in THF (4 mL) was cooled to -78°C under argon. Subsequently,

n-butyllithium (0.303 mL, 1.6 M in hexane, 0.49 mmol) was added dropwise and the reaction mixture was stirred for 45 min at -78°C . Distilled HMPA (0.087 g, 0.49 mmol) was then added. After stirring for 10 min at -78°C , a solution of trimethoxybenzaldehyde (0.397 g, 2.02 mmol) in THF (2 mL), previously dried over molecular sieves (4 Å), was added dropwise. After 1 h at -78°C , the reaction was quenched by slow addition of water. The aqueous phase was then extracted with EtOAc and the organic phase was washed with brine. The organic phase was dried over anhydrous $MgSO_4$ and concentrated. Flash chromatography (petroleum ether:EtOAc, 9:1) afforded **6k** (0.102 g, 44%) as a brown foam; IR (KBr) 2216, 1720 cm^{-1} ; ^1H NMR (CDCl_3) δ 7.53-7.42 (m, 4 H), 7.34-7.30 (m, 6 H), 6.78 (s, 2 H), 6.70 (s, 1 H), 5.91 (bs, 1 H), 3.84 (s, 3 H), 3.84 (s, 6 H), 2.70 (s, 1 H), 1.54 (s, 9 H); ^{13}C NMR (CDCl_3) δ 154.8 (*s*), 153.5 (*s*), 151.7 (*s*), 143.4 (*d*), 137.8 (*s*), 135.1 (*s*), 131.6 (*d*), 131.5 (*d*), 128.9 (*d*), 128.7 (*d*), 128.6 (*d*), 128.5 (*d*), 122.6 (*s*), 122.5 (*s*), 110.3 (*s*), 106.6 (*s*), 102.9 (*d*), 93.9 (*s*), 90.9 (*s*), 82.7 (*s*), 81.5 (*s*), 81.1 (*s*), 70.2 (*d*), 61.0 (*q*), 56.2 (*q*), 28.4 (*q*). HRMS (TOF ES+) m/z $[M+Na]^+$ calcd for $C_{35}H_{33}NO_7^{23}Na$: 602.2154; found 602.2170.

4-(*tert*-butoxycarbonyl)-2-[(*tert*-butyl-dimethyl-silanyloxy)-(3,4,5-trimethoxy-phenyl)-methyl]-3,5-diphenyl-6-formyl-[1,4]-oxazine

(7a). To a stirred solution of 4-(*tert*-butoxycarbonyl)-3,5-diphenyl-2-[hydroxy-(3,4,5-

trimethoxy-phenyl)-methyl]-[1,4]-oxazine **6c** (0.758 g, 1.43 mmol) in dry DMF (10 ml) were added *tert*-butyldimethylchlorosilane (0.645 g, 4.28 mmol) and imidazole (0.582 g, 8.58 mmol). The resulting solution was stirred and heated at 40°C for 20 h. Then EtOAc was added and the resulting mixture was washed with a saturated solution of NaHCO₃ and then with brine. The organic phase was dried over anhydrous MgSO₄ and concentrated. Flash chromatography (petroleum ether:EtOAc, 9:1) afforded 4-(*tert*-butoxycarbonyl)-2-[(*tert*-butyl-dimethyl-silanyloxy)-(3,4,5-trimethoxy-phenyl)-methyl]-3,5-diphenyl-[1,4]-oxazine (0.838 g, 91%) as a white solid; mp 128-129°C; IR 2956, 1719, 1635, 1592, 1125 cm⁻¹; ¹H NMR (CDCl₃) δ 7.55-7.28 (m, 10 H), 6.83 (s, 1 H), 6.79 (s, 2 H), 5.62 (s, 1 H), 3.86 (s, 6 H), 3.85 (s, 3 H), 1.08 (s, 9 H), 0.86 (s, 9 H), -0.14 (s, 3 H), -0.22 (s, 3 H); ¹³C NMR (CDCl₃) δ 153.4 (s), 148.8 (s), 138.4 (d), 136.6 (s), 136.0 (s), 134.5 (s), 128.6 (d), 128.5 (d), 128.3 (d), 128.0 (d), 127.7 (s), 127.5 (d), 124.5 (d), 103.1 (d), 81.6 (s), 69.5 (d), 61.0 (q), 56.1 (q), 27.9 (s), 25.9 (s), 18.3 (s), -4.6 (q), -5.3 (q). MS (IS) m/z (%) = 668.5 [M+Na]⁺ (100). A solution of the silylated compound (0.150 g, 0.23 mmol) in THF (8 mL) was cooled to -78°C under argon. Subsequently, *n*-butyllithium (0.218 mL, 1.6 M in hexane, 0.35 mmol) was added dropwise. After stirring for 45 min at -78°C, a solution of DMF (0.085 g, 1.16 mmol) in THF (1 mL), previously dried over molecular sieves (4 Å), was added dropwise. After 2 h at -78°C, the reaction was quenched by slow addition of water. The aqueous phase was then extracted with EtOAc and the organic phase was washed with brine. The organic phase was dried over anhydrous MgSO₄ and concentrated. Flash chromatography (petroleum ether:EtOAc, 9:1) afforded **7a** (0.091 g, 58%) as a pale yellow oil; IR 2956, 2931, 2858, 1727, 1679, 1594, 1232, 1146 cm⁻¹; ¹H NMR (CDCl₃) δ 9.34 (s, 1 H), 7.56-7.40 (m, 10 H), 6.77 (s, 2 H), 5.45 (s, 1 H), 3.88 (s, 6 H), 3.84 (s, 6 H), 1.00 (s, 9 H), 0.81 (s, 9 H), -0.19 (s, 3 H), -0.27 (s, 3 H); ¹³C NMR (CDCl₃) δ 182.9 (d), 153.0 (s), 150.8 (s), 149.5 (s), 144.6 (s), 144.2 (s), 137.4 (s), 135.9 (s), 134.7 (s), 132.5 (s), 130.0 (d), 129.2 (d), 128.7 (d), 128.6 (d), 128.5

(d), 128.3 (d), 123.9 (s), 103.7 (d), 82.8 (s), 70.0 (d), 60.9 (q), 56.1 (q), 27.6 (q), 25.7 (q), 18.1 (s), -4.9 (q), -5.3 (q). HRMS (TOF ES+) m/z $[M+Na]^+$ calcd for $C_{38}H_{47}NO_8^{23}NaSi$: 696.29687; found 696.29687.

4-(*tert*-butoxycarbonyl)-2-[(*tert*-butyl-dimethyl-silanyloxy)-(3,4,5-trimethoxy-phenyl)-methyl]-3,5-diphenyl-6-tributylstannanyl-[1,4]-

oxazine (7b). Compound **7b** was prepared according to the procedure reported for **7a** starting from the silylated compound (0.200 g, 0.31 mmol) and tributyltin chloride (0.504 g, 1.55 mmol). After 2 h at -78°C , the reaction was quenched by slow addition of a saturated aqueous solution of KF. After filtration of the white precipitate through Celite, the aqueous phase was extracted with EtOAc and the organic phase was washed with brine. The organic phase was dried over anhydrous $MgSO_4$ and concentrated. Flash chromatography (petroleum ether:EtOAc, 9:1) afforded **7b** (0.107 g, 37%) as a pale yellow oil; IR 2955, 2928, 2855, 1715, 1592, 1506, 1463, 1329, 1130 cm^{-1} ; ^1H NMR (CDCl_3) δ 7.59-7.26 (m, 10 H), 6.80 (s, 2 H), 5.64 (s, 1 H), 3.87 (s, 6 H), 3.84 (s, 3 H), 1.31-1.13 (m, 12 H), 1.03 (s, 9 H), 0.85 (s, 9 H), 0.83-0.77 (m, 15 H), -0.09 (s, 3 H), -0.24 (s, 3 H); ^{13}C NMR (CDCl_3) δ 158.4 (s), 153.0 (s), 151.9 (s), 149.4 (s), 137.9 (s), 137.2 (s), 136.9 (s), 136.6 (s), 135.8 (s), 128.7 (d), 128.4 (d), 128.3 (d), 127.9 (d), 127.6 (d), 127.3 (d), 124.0 (s), 103.0 (d), 80.9 (s), 69.8 (d), 60.9 (q), 56.0 (q), 28.9 (t), 28.0 (s), 27.3 (t), 26.0 (s), 18.4 (s), 13.8 (q), 11.2 (t), -4.4 (q), -5.3 (q). HRMS (TOF ES+) m/z $[M+Na]^+$ calcd for $C_{49}H_{73}NO_7^{23}NaSi^{120}Sn$: 958.4076; found 958.4086.

3,5-bis-phenylethynyl-4-(*tert*-butoxycarbonyl)-2-[(*tert*-butyl-dimethyl-silanyloxy)-(3,4,5-trimethoxy-phenyl)-methyl]-6-formyl-

[1,4]-oxazine (7c). To a stirred solution of 3,5-bis-phenylethynyl-4-(*tert*-butoxycarbonyl)-2-[hydroxy-(3,4,5-trimethoxy-phenyl)-methyl]-[1,4]-oxazine **6k** (0.100

g, 0.17 mmol) in dry DMF (3 ml) were added *tert*-butyldimethylchlorosilane (0.078 g, 0.52 mmol) and imidazole (0.070 g, 1.04 mmol). The resulting solution was stirred and heated at 50°C for 14 h. Then EtOAc was added and the resulting mixture was washed with a saturated solution of NaHCO₃ and then with brine. The organic phase was dried over anhydrous MgSO₄ and concentrated. Flash chromatography (petroleum ether:EtOAc, 8:2 + 1% Et₃N) afforded 3,5-bis-phenylethynyl-4-(*tert*-butoxycarbonyl)-2-[(*tert*-butyl-dimethyl-silanyloxy)-(3,4,5-trimethoxy-phenyl)-methyl]-[1,4]-oxazine (0.093 g, 78%) as a yellow oil; IR (KBr) 1724 cm⁻¹; ¹H NMR (CDCl₃) δ 7.50-7.46 (m, 4 H), 7.36-7.30 (m, 6 H), 6.78 (s, 2 H), 6.69 (s, 1 H), 5.96 (s, 1 H), 3.85 (s, 3 H), 3.84 (s, 6 H), 1.54 (s, 9 H); 0.99 (s, 9 H), 0.22 (s, 6 H), ¹³C NMR (CDCl₃) δ 155.9 (s), 153.3 (s), 151.9 (s), 151.4 (s), 144.0 (d), 137.4 (s), 135.9 (s), 131.6 (d), 131.4 (d), 128.8 (d), 128.6 (d), 128.6 (d), 128.4 (d), 122.7 (s), 110.0 (s), 106.3 (s), 102.6 (d), 93.3 (s), 90.8 (s), 82.5 (s), 82.2 (s), 81.3 (s), 70.3 (d), 61.0 (q), 56.2 (q), 28.4 (q), 26.0 (q), 18.5 (s), -4.5 (q), -4.9 (q). MS (IS) m/z (%) = 716.5 [M+Na]⁺ (100). A solution of the silylated compound (0.118 g, 0.17 mmol) in THF (3 mL) was cooled to -78°C under argon. Subsequently, *n*-butyllithium (0.159 mL, 1.6 M in hexane, 0.26 mmol) was added dropwise. After stirring for 45 min at -78°C, a solution of DMF (0.062 g, 0.85 mmol) in THF (1 mL), previously dried over molecular sieves (4 Å), was added dropwise. After 2 h at -78°C, the reaction was quenched by slow addition of water. The aqueous phase was then extracted with EtOAc and the organic phase was washed with brine. The organic phase was dried over anhydrous MgSO₄ and concentrated. Flash chromatography (petroleum ether:EtOAc, 8:2) afforded **7c** (0.093 g, 76%) as a yellow foam; IR (KBr) 2948, 2932, 1730, 1684 cm⁻¹; ¹H NMR (CDCl₃) δ 9.83 (s, 1 H), 7.53-7.51 (m, 4 H), 7.38-7.36 (m, 6 H), 6.84 (s, 2 H), 5.79 (s, 1 H), 3.84 (s, 6 H), 3.84 (s, 3 H), 1.56 (s, 9 H); 0.96 (s, 9 H), 0.18 (s, 3 H), 0.14 (s, 3 H), ¹³C NMR (CDCl₃) δ 181.2 (d), 156.1 (s), 153.1 (s), 150.2 (s), 148.5 (s), 137.6 (s), 135.5 (s), 131.8 (d), 131.3 (d), 129.9 (d), 129.0 (d), 128.7 (d), 124.6 (s), 122.6 (s), 121.4 (s), 105.6 (s), 103.2

(*d*), 99.0 (*s*), 94.2 (*s*), 83.7 (*s*), 81.3 (*s*), 79.1 (*s*), 71.0 (*d*), 60.9 (*q*), 56.1 (*q*), 28.3 (*q*), 25.9 (*q*), 18.4 (*s*), -4.5 (*q*), -4.9 (*q*). HRMS (TOF ES⁺) *m/z* [M+Na]⁺ calcd for C₄₂H₄₇NO₈²³NaSi : 744.2968; found 744.2957.

4-(*tert*-butoxycarbonyl)-3,5-diphenyl-2-vinyl-[1,4]-oxazine (8). A solution of methyltriphenyl-phosphonium bromide (0.411 g, 1.15 mmol) in THF (3 mL)

was cooled to -20°C under argon. Subsequently, *n*-butyllithium (0.719 mL, 1.6 M in hexane, 1.15 mmol) was added dropwise. After stirring for 1 h at -20°C, the reaction mixture was cooled to -78°C and a solution of 4-(*tert*-butoxycarbonyl)-3,5-diphenyl-2-formyl-[1,4]-oxazine **6e** (0.209 g, 0.58 mmol) in THF (3 mL) was added dropwise. After 45 min at -78°C, the reaction was quenched by slow addition of water. The aqueous phase was then extracted with EtOAc and the organic phase was washed with brine. The organic phase was dried over anhydrous MgSO₄ and concentrated. Flash chromatography (petroleum ether:EtOAc, 9:1) afforded **8** (0.123 g, 59%) as a pale yellow solid; mp 236-237°C; IR (KBr) 2977, 1719, 1638, 1311, 1157 cm⁻¹; ¹H NMR (CDCl₃) δ 7.51-7.26 (m, 10 H), 6.86 (s, 1 H), 6.48 (dd, *J* = 17.0 and 11.1 Hz, 1 H), 5.71 (dd, *J* = 17.0 and 1.6 Hz, 1 H), 5.18 (dd, *J* = 11.1 and 1.6 Hz, 1 H), 1.05 (s, 9 H); ¹³C NMR (CDCl₃) δ 152.2 (*s*), 145.2 (*s*), 137.8 (*d*), 135.9 (*s*), 134.3 (*s*), 128.6 (*d*), 128.5 (*d*), 128.2 (*d*), 127.8 (*s*), 127.6 (*d*), 127.3 (*d*), 127.1 (*d*), 124.8 (*s*), 124.3 (*d*), 115.8 (*d*), 81.6 (*s*), 27.7 (*q*). Anal. calcd for C₂₃H₂₃NO₃: C, 76.43%; H, 6.41%; N, 3.88%. Found: C, 76.20%; H, 6.26%; N, 3.67%.

4-(*tert*-butoxycarbonyl)-3,5-diphenyl-2-(3-hydroxy-prop-1-ynyl)-[1,4]-oxazine (9). To a stirred solution of **6i** (0.100 g, 0.22 mmol) in

Et₂NH/DMF 3:1 (2 mL), propargylic alcohol (0.024 g, 0.43 mmol) and CuI (0.008 g, 0.04 mmol) were added under argon. Then the flask was evacuated and backfilled with argon three

times. Under argon, $\text{PdCl}_2(\text{PPh}_3)_2$ (0.030 g, 0.04 mmol) was added, and the mixture was heated at 60°C during 5 min. After cooling, water was added and the mixture was extracted with EtOAc. The organic phase was washed with brine, dried over anhydrous MgSO_4 and concentrated. Flash chromatography (petroleum ether:EtOAc, 8:2) afforded **9** (0.064 g, 74 %) as a brown foam; IR (KBr) 3423, 2976, 2919, 1721, 1346, 1158 cm^{-1} ; ^1H NMR (CDCl_3) δ 7.74-7.71 (m, 2 H), 7.47-7.25 (m, 8 H), 6.81 (s, 1H), 4.36 (s, 2H), 1.06 (s, 9 H); ^{13}C NMR (CDCl_3) δ 151.8 (s), 138.1 (d), 134.7 (s), 134.0 (s), 131.4 (s), 131.0 (s), 128.7 (d), 128.2 (d), 128.2 (d), 127.7 (d), 127.3 (s), 127.2 (d), 124.5 (d), 93.1 (s), 82.2 (s), 78.4 (s), 51.4 (t), 27.7 (q). MS (IS) m/z (%) = 412.5 $[\text{M}+\text{Na}]^+$ (100).

4-(*tert*-butoxycarbonyl)-3-tributylstannanyl-[1,4]-oxazine (10a). A solution of 4-(*tert*-butoxycarbonyl)-[1,4]-oxazine **5** (0.080 g, 0.44 mmol) in THF (4 mL) was cooled to -78°C under argon. Subsequently, *n*-butyllithium (0.327 mL, 1.6 M in hexane, 0.52 mmol) was added dropwise. After stirring for 5 min at -78°C , a solution of tributyltin chloride (0.711 g, 2.18 mmol) in THF (1 mL), previously dried over molecular sieves (4 Å), was added dropwise. After 30 min at -78°C , the reaction was quenched by slow addition of a saturated aqueous solution of KF. After filtration of the white precipitate through Celite, the aqueous phase was extracted with EtOAc and the organic phase was washed with brine. The organic phase was dried over anhydrous MgSO_4 and concentrated. Flash chromatography (pentane:EtOAc, 9:1) afforded **10a** (0.113 g, 55%) as a colorless oil; IR (NaCl) 2956, 2924, 2871, 2854, 1684, 1598, 1391, 1128 cm^{-1} ; ^1H NMR (CDCl_3) δ 5.82 (d, J = 5.0 Hz, 1 H), 5.54 (d, J = 5.0 Hz, 1 H), 5.30 (s, 1 H), 1.46-1.60 (m, 6 H), 1.44 (s, 9 H), 1.27-1.35 (m, 6 H), 0.82-0.92 (m, 15 H); ^{13}C NMR (CDCl_3) δ 150.0 (s), 134.9 (d), 129.3 (d), 119.0 (s), 109.1 (d), 80.9 (s), 28.5 (t), 27.8 (q), 26.9 (t), 13.3 (q), 12.0 (t). Slow decomposition of **10a** over several hours precluded satisfactory HRMS analysis.

General procedure for the preparation of the monosubstituted derivatives.

4-(*tert*-butoxycarbonyl)-3-methoxycarbonyl-[1,4]-oxazine (**10b**). A solution

of 4-(*tert*-butoxycarbonyl)-[1,4]-oxazine **5** (0.100 g, 0.55 mmol) in THF (5 mL) was cooled to -78°C under argon. Subsequently, *n*-butyllithium (0.375 mL, 1.6 M in hexane, 0.60 mmol) was added dropwise. After stirring for 5 min at -78°C , a solution of methyl cyanofomate (0.232 g, 2.73 mmol) in THF (1 mL), previously dried over molecular sieves (4 Å), was added dropwise. After 30 min at -78°C , the reaction was quenched by slow addition of water. The aqueous phase was then extracted with EtOAc and the organic phase was washed with brine. The organic phase was dried over anhydrous MgSO_4 and concentrated. Flash chromatography (petroleum ether:EtOAc, 8:2) afforded **10b** (0.108 g, 82%) as a yellow oil; IR 2977, 1729, 1705, 1627, 1353, 1332, 1289, 1240, 1085 cm^{-1} ; ^1H NMR (CDCl_3) δ 6.81 (s, 1 H), 6.13 (d, J = 3.8 Hz, 1 H), 5.97 (d, J = 4.0 Hz, 1 H), 3.78 (s, 3 H), 1.47 (s, 9 H); ^{13}C NMR (CDCl_3) δ 163.4 (s), 150.3 (s), 143.9 (d), 133.1 (d), 116.6 (s), 112.7 (d), 82.3 (s), 52.0 (q), 28.1 (q). HRMS (EI) m/z $[\text{M}]^{+\bullet}$ calcd for $\text{C}_{11}\text{H}_{15}\text{NO}_5$: 241.09502; found 241.0954.

4-(*tert*-butoxycarbonyl)-3-(1-hydroxy-cyclohexyl)-[1,4]-oxazine (**10c**).

Compound **10c** was prepared according to the procedure reported for **10b** starting from 4-(*tert*-butoxycarbonyl)-[1,4]-oxazine **5** (0.100 g, 0.55 mmol) and distilled cyclohexanone (0.268 g, 2.73 mmol). Flash chromatography (petroleum ether:EtOAc, 9:1) afforded **10c** (0.099 g, 64%) as a colorless oil; IR 3390, 2932, 2857, 1682, 1632, 1371, 1356, 1149, 1119 cm^{-1} ; ^1H NMR (CDCl_3) δ 6.38 (s, 1 H), 6.14 (s, 1 H), 6.11 (d, J = 3.8 Hz, 1 H), 5.94 (d, J = 3.8 Hz, 1 H), 1.60-1.80 (m, 6 H), 1.50 (s, 9 H), 1.25-1.45 (m, 4 H); ^{13}C NMR (CDCl_3) δ 153.2 (s), 139.5 (d), 135.8 (d), 127.1 (s), 112.6 (d), 82.7 (s), 70.2 (s), 36.6 (t), 28.4

(*q*), 26.0 (*t*), 22.7 (*t*). HRMS (EI) m/z $[M]^+$ calcd for $C_{15}H_{23}NO_4$: 281.16271; found 281.1622.

4-(*tert*-butoxycarbonyl)-3-trimethylsilyl-[1,4]-oxazine (10d). Compound **10d**

was prepared according to the procedure reported for **10b** starting from 4-(*tert*-butoxycarbonyl)-[1,4]-oxazine **5** (0.080 g, 0.44 mmol) and trimethylsilyl chloride (0.237 g, 2.18 mmol). After evaporation of the solvent, the desired compound **10d** was obtained (0.111 g, 100%) as a colorless oil; 1H NMR ($CDCl_3$) δ 5.87 (d, J = 4.8 Hz, 1 H), 5.66 (s, 1 H), 5.59 (d, J = 4.5 Hz, 1 H), 1.46 (s, 9 H), 0.15 (s, 9 H); ^{13}C NMR ($CDCl_3$) δ 149.6 (*s*), 139.1 (*d*), 129.8 (*d*), 120.9 (*s*), 110.8 (*d*), 81.0 (*s*), 28.4 (*q*), 1.0 (*q*). Slow decomposition of **10d** over several hours precluded satisfactory HRMS and IR analysis.

spiro[cyclohexan-1,3' [1H, 3H] oxazolo[4,3-c] [1,4] oxazin]-1'-one (11). A

solution of 4-(*tert*-butoxycarbonyl)-3-(1-hydroxy-cyclohexyl)-[1,4]-oxazine **10c** (0.093 g, 0.33 mmol) in THF (3 mL) was cooled to 0°C under argon. Subsequently, NaH (0.015 g, 60wt% in mineral oil, 0.36 mmol) was added. After stirring for 2h at room temperature, the reaction was quenched by slow addition of water. The aqueous phase was then extracted with EtOAc and the organic phase was washed with brine. The organic phase was dried over anhydrous $MgSO_4$ and concentrated. Flash chromatography (pentane:EtOAc, 9:1) afforded **11** (0.037 g, 54%) as a colorless oil; IR (NaCl) 3019, 2943, 2397, 1755, 1215 cm^{-1} ; 1H NMR ($CDCl_3$) δ 5.75 (d, J = 5.0 Hz, 1 H), 5.56 (d, J = 5.0 Hz, 1 H), 5.43 (s, 1 H), 1.96-1.26 (m, 10 H); ^{13}C NMR ($CDCl_3$) δ 150.0 (*s*), 131.0 (*d*), 127.9 (*s*), 120.2 (*d*), 105.7 (*d*), 82.6 (*s*), 36.6 (*t*), 24.4 (*t*), 21.5 (*t*). MS (IS) m/z (%) = 230.0 $[M+Na]^+$ (100).