Electronic Supplementary Information (ESI)

for

Direct C–H Functionalization of Difluoroboron Dipyrromethenes (BODIPYs) at β-position by Iodonium Salts and Its Application

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1. Experimental Details and Compound Characterization

1.1. Materials and Instrumentation

All commercially available reagents were used as received. Unless otherwise specified, all reactions were carried out under an atmosphere of argon in oven-dried glassware with magnetic stirring. $^1$H NMR spectra and proton-decoupled $^{13}$C NMR spectra were obtained on a 400 MHz or 500 MHz Bruker NMR spectrometer. $^1$H Chemical shifts (δ) are reported in parts per million (ppm) relative to TMS (s, δ 0). Multiplicities are given as: s (singlet), d (doublet), t (triplet) and m (multiplet). Complex splitting will be described by a combination of these abbreviations, i.e. dd (doublet of doublets). $^{13}$C NMR chemical shifts are reported relative to CDCl$_3$ (t, δ 77.4). High-resolution mass spectra were recorded on positive ESI mode. Chromatographic purifications were performed by flash chromatography with silica gel (40–63 μm) packed in glass columns. The eluting solvent for the purification of each compound was determined by thin-layer chromatography (TLC) on glass plates coated with silica gel 60 F254 and visualized by ultraviolet light. High-resolution mass data were obtained on an Agilent 6224 Accurate-Mass TOF LC/MS. Absorption spectra were acquired using a Varian Cary 300 spectrophotometer. Fluorescence measurements were carried out on a Horiba FluoroMax 4 spectrometer. Quantum yields were determined in reference to either Fluorescein or Rhodamine 6G and corrected for solvent refractive index. The extinction coefficients were determined through Beer’s Law plots. All data were measured at room temperature. Human breast cancer cell line MDA-MB-231 and human epidermoid carcinoma cell line A-431 were obtained from the American Type Culture Collection (Manassas, VA, USA) and were cultured in DMEM (high glucose) and RPMI 1640 medium respectively, supplemented with 10% fetal bovine serum (HyClone, Logan, UT). Cells were incubated at 37°C in 5% CO$_2$ in air.

1.2. Experimental procedures for the synthesis of 3a-k, 4a-k and 6a-f

Diaryliodonium salts SA1-11 were prepared according to the literature procedures.$^{1,2}$

*mesityl(phenyl)- 3$^\lambda$-iodanyl trifluoromethanesulfonate (SA1)

![Image of SA1 structure]

A white powder. $^1$H NMR (400 MHz, CDCl$_3$) δ 7.72 – 7.67 (m, 2 H), 7.56 – 7.49 (m, 1 H), 7.44 – 7.38 (m, 2 H), 7.11 (s, 2 H), 2.63 (s, 6 H), 2.36 (s, 3 H).

*mesityl(p-tolyl)- 3$^\lambda$-iodanyl trifluoromethanesulfonate (SA2)

![Image of SA2 structure]

A white powder. $^1$H NMR (400 MHz, CDCl$_3$) δ 7.57 (d, $J = 8.5$ Hz, 2 H), 7.22 (d, $J = 8.5$ Hz, 2 H), 7.10 (s, 2 H), 2.63 (s, 6 H), 2.38 (s, 3 H), 2.36 (s, 3 H).

*mesityl(m-tolyl)- 3$^\lambda$-iodanyl trifluoromethanesulfonate (SA3)

![Image of SA3 structure]

A white powder. $^1$H NMR (400 MHz, CDCl$_3$) δ 7.59 (s, 1 H), 7.40 (d, $J = 8.1$ Hz, 1 H), 7.33 (d, $J = 7.5$ Hz, 1 H).
Hz, 1 H), 7.27 (t, J = 8.1 Hz & 7.5 Hz, 1 H), 7.11 (s, 2 H), 2.63 (s, 6 H), 2.36 (s, 6 H).

**mesityl(o-tolyl)- 3^3^-iodanyl trifluoromethanesulfonate (SA4)**

A white powder. $^1$H NMR (400 MHz, CDCl$_3$) δ 7.50 – 7.41 (m, 3 H), 7.20 – 7.15 (m, 1 H), 7.12 (s, 2 H), 2.60 (s, 9 H), 2.36 (s, 3 H).

**methyl 4-(mesityl(((trifluoromethyl)sulfonyl)oxy)- 3^3^-iodanyl)benzoate (SA5)**

A white powder. $^1$H NMR (400 MHz, CDCl$_3$) δ 8.01 (d, J = 8.7 Hz, 2 H), 7.78 (d, J = 8.7 Hz, 2 H), 7.11 (s, 2 H), 3.91 (s, 3 H), 2.62 (s, 6 H), 2.36 (s, 3 H).

**mesityl(4-(trifluoromethyl)phenyl)- 3^3^-iodanyl trifluoromethanesulfonate (SA10)**

A white powder. $^1$H NMR (400 MHz, CDCl$_3$) δ 7.81 (d, J = 8.3 Hz, 2 H), 7.66 (d, J = 8.3 Hz, 2 H), 7.15 (s, 2 H), 2.63 (s, 6 H), 2.39 (s, 3 H).
mesityl(4-methoxyphenyl)-3\(^\text{iodanyl trifluoromethanesulfonate (SA11)}\)

\[
\begin{align*}
\text{OTf} & \\
\text{O} & \\
\text{A white powder.} & \\
\end{align*}
\]

\(^1\text{H NMR (400 MHz, CDCl}_3\) \(\delta\) 7.67 (d, \(J = 9.1\) Hz, 2 H), 7.07 (s, 2 H), 6.92 (d, \(J = 9.1\) Hz, 2 H), 3.80 (s, 3 H), 2.64 (s, 6 H), 2.33 (s, 3 H).

The general synthetic method for SA12-17

Micro copper powder (0.5 mmol) and sodium methanolate (0.5 mmol) were added to a stirred solution of phenylacetylene or alkyne (5.0 mmol) and bis(pinacolato)diboron (7.5 mmol) in 100 mL anhydrous ethanol at room temperature. After the phenylacetylene or alkyne was completely consumed according to TLC, the product was extracted with brine and acetic ether. The organic layer was dried with \(\text{Na}_2\text{SO}_4\) and concentrated. The residue was purified by silica gel column chromatography (hexane: acetic ether = 50 : 1 to 20:1) to afford pure product.

To a solution of first step product (1 mmol) in acetone (30 mL) and water (15 mL) were added \(\text{NH}_4\text{OAc}\) (6 mmol) and \(\text{NaIO}_4\) (6 mmol). The resulting reaction mixture was stirred at room temperature overnight until the material was consumed. The reaction mixture was diluted with \(\text{Et}_2\text{O}\), and filtered through a pad of cellite. The filtrate was concentrated to give aryl boronic as a solid.

The corresponding alkenyl boronic acid (1.00 mmol) was suspended in dry dichloromethane (30 mL) at 0 °C. Boron trifluoride diethyl etherate (1.2 mmol) was added dropwise via syringe and stirred at 0 °C for 15 min or until all the boronic acid had dissolved. Iodo-mesitylene diacetate (1.2 mmol) was added as a solution in dichloromethane (15 mL) via syringe. The reaction mixture was stirred for 1 hour or until complete consumption of the iodoarene diacetate, at which point trifluoromethanesulfonic acid (1.2 mmol) was added. After stirring 15 min, \(\text{H}_2\text{O}\) (50 mL) was added. The aqueous phase was extracted with dichloromethane (3 * 50 mL) and the combined organic phases were dried by \(\text{Na}_2\text{SO}_4\) and concentrated. The crude residue was then recrystallized from dichloromethane/\(\text{Et}_2\text{O}\) or triturated with \(\text{Et}_2\text{O}\) to obtain the desired compound as a white powder.

SA12 (E)-mesityl(styryl)-3\(^\text{iodanyl trifluoromethanesulfonate.}\)
I

OTf

A white powder.(219mg, 44%). \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 7.38 – 7.29 (m, 6 H), 7.14 (s, 2 H), 6.97 (d, \(J = 14.4\) Hz, 1 H), 2.64 (s, 6 H), 2.38 (s, 3 H). \(^1\)C NMR (126 MHz, CDCl\(_3\)) \(\delta\) 144.6, 143.9, 143.0, 134.4, 130.6, 130.3, 129.1, 127.6, 121.6, 119.0, 116.8, 97.1, 27.0, 21.2.

SA13  (E)-(4-fluorostyryl)(mesityl)- 3'-iodanyl trifluoromethanesulfonate.

I

OTf

F

A white powder(332mg, 64%). \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 7.34 (m, 2 H), 7.28 – 7.24 (m, 1 H), 7.14 (s, 2 H), 7.08 – 6.96 (m, 3 H), 2.64 (s, 6 H), 2.38 (s, 3 H). \(^1\)C NMR (126 MHz, CDCl\(_3\)) \(\delta\) 165.0, 163.0, 144.7, 143.1, 136.8, 132.8, 130.4, 129.7, 129.6, 116.3, 116.1, 96.1, 27.0, 21.2.

SA14  (E)-(4-chlorostyryl)(mesityl)- 3'-iodanyl trifluoromethanesulfonate

I

OTf

Cl

A white powder(420mg, 79%). \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 7.36 – 7.26 (m, 5 H), 7.15 (s, 2 H), 6.96 (d, 1 H), 2.64 (s, 6 H), 2.39 (s, 3 H). \(^1\)C NMR (126 MHz, CDCl\(_3\)) \(\delta\) 144.8, 143.1, 130.4, 129.3, 128.9, 116.5, 97.2, 27.0, 21.2.

SA15  (E)-(4-bromostyryl)(mesityl)- 3'-iodanyl trifluoromethanesulfonate.

I

OTf

Br

A white powder (340mg, 59%). \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 7.50 – 7.45 (m, \(J = 8.5\) Hz, 2 H), 7.35 (d, \(J = 14.4\) Hz, 1 H), 7.20 (m, \(J = 8.5\) Hz, 2 H), 7.15 (s, 2 H), 6.92 (d, \(J = 14.4\) Hz, 1 H), 2.64 (s, 6 H), 2.39 (s, 3 H). \(^1\)C NMR (126 MHz, CDCl\(_3\)) \(\delta\) 144.7, 143.0, 142.7, 133.2, 132.3, 130.4, 129.0, 125.1, 116.6, 97.8, 27.0, 21.2.

SA16  (E)-mesityl(4-methylstyryl)- 3'-iodanyl trifluoromethanesulfonate.

I

OTf

A white powder.(130mg, 25%). \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 7.25 (d, \(J = 8.6\) Hz, 1 H), 7.21 (s, 2 H), 7.14 (d, \(J = 8.6\) Hz, 4 H), 6.97 (d, \(J = 14.3\) Hz, 1 H), 2.64 (s, 6 H), 2.38 (s, 3 H), 2.33 (s, 3 H). \(^1\)C NMR (126 MHz, CDCl\(_3\)) \(\delta\) 144.5, 144.4, 143.0, 141.3, 131.6, 130.3, 129.7, 127.6, 116.8, 95.5, 27.0, 21.4, 21.2.

SA17  (E)-mesityl(pent-1-en-1-yl)- 3'-iodanyl trifluoromethanesulfonate.
Acetyl chloride (3.4 mL, 47.77 mmol) was dropwisely added via syringe to a stirred solution of 2,4-dimethylpyrrole (10.8 mL, 105.1 mmol, 2.2 eq) in dry dichloromethane (200 mL) at 0 °C under an argon atmosphere. After acetyl chloride was completely added, the resulting solution was taken into 50-60 °C oil bath pan and stirred for additional 1-2 hours. After removed the most solvent in vacuo, the residue was dissolved in 500 mL dry dichloromethane/toluene (5/95, v/v). Trimethylamine (39.8 mL, 286.64 mmol) and BF₃·Et₂O (47.2 mL, 382.19 mmol) were sequentially added to the solution at 0 °C. Then the reaction was stirred at 50-60 °C for 1-2 h until the intermediate was consumed according to TLC. Then pour the reaction solution into ice-cold water and extract with dichloromethane. The organic layer was washed by water (3*500 mL), brine (3*500 mL), dried with Na₂SO₄ and concentrated. The residue was purified by silica gel column chromatography (hexane/acetic ether = 50/1 to 10/1) to afford pure product 1 (5.2 g, 42%) as a brownish red solid. ¹H NMR (400 MHz, CDCl₃) δ 6.08 (s, 2H), 2.60 (s, 3H), 2.54 (s, 6H), 2.44 (s, 6H).

2,4-Dimethylpyrrole (2.15 g, 22 mmol) and benzaldehyde (1.06 g, 11 mmol) were dissolved in 150 mL CH₂Cl₂ with a catalytic amount of TFA (0.5 mL). The mixture was stirred for 16 h at r.t. Then a solution of 2,3-dichloro-5,6-dicyanobenzoquinone (DDQ) (2.27 g, 10 mmol) was added, and the mixture was stirred for 15 min. Finally, BF₃·Et₂O (20 mL, excess) and triethylamine (20 mL, excess) were added, and the mixture was stirred for 3 h at r.t. The crude mixture was diluted with CH₂Cl₂ and washed with H₂O. The organic extracts were dried over MgSO₄, filtered and evaporated under reduced pressure. Flash chromatography (hexane:CH₂Cl₂ 1:1). 2.00 g of compound 6 as an orange solid (61% yield). ¹H NMR (400 MHz, CDCl₃) δ 7.54 – 7.47 (m, 3H), 7.33 – 7.29 (m, 2H), 6.00 (s, 2H), 2.58 (s, 6H), 1.39 (s, 6H).

2. Optical properties of BODIPY dyes

| dyes | λabs (nm) | ε (M⁻¹·cm⁻¹) | λex (nm) | λem (nm) | ϕF | Stokes shift (nm) |
|------|-----------|---------------|----------|----------|-----|------------------|
| 1    | 497       | 104500        | 496      | 509      | 0.79 | 13               |
| 3a   | 509       | 95000         | 507      | 532      | 0.61 | 25               |
Data were measured in a concentration of $3.0 \times 10^{-6}$ M. bData were measured in a concentration of $1.0 \times 10^{-6}$ M. cThe fluorescence quantum yields ($\Phi$) were calculated using Fluorescein in 0.1N NaOH solution ($\Phi = 0.91$, excitation = 488 nm).

### Table S2 Photophysical properties of BODIPY dyes 1, 3a-k in EtOH at room temperature

| dyes | $\lambda_{ab}$ | $\epsilon$ | $\lambda_{ex}$ | $\lambda_{em}$ | $\Phi^{a,c}$ | Stokes shift |
|------|----------------|------------|----------------|----------------|-------------|--------------|
|      | (nm)           | (M$^{-1}$ cm$^{-1}$) | (nm)          | (nm)          |             | (nm)         |
| 1    | 495            | 72400      | 493            | 505            | 1.04        | 12           |
| 3a   | 505            | 85800      | 505            | 531            | 0.76        | 26           |
| 3b   | 507            | 79000      | 506            | 539            | 0.64        | 33           |
| 3c   | 507            | 36100      | 505            | 531            | 0.64        | 26           |
| 3e   | 507            | 76500      | 506            | 551            | 0.27        | 45           |
| 3f   | 503            | 72000      | 504            | 524            | 0.74        | 20           |
| 3g   | 505            | 85700      | 505            | 527            | 0.71        | 22           |
| 3h   | 505            | 75100      | 504            | 529            | 0.66        | 25           |
| 3i   | 505            | 69900      | 503            | 530            | 0.55        | 27           |
| 3j   | 505            | 79400      | 505            | 529            | 0.65        | 24           |
| 3k   | 505            | 88600      | 503            | 525            | 0.64        | 22           |

aData were measured in a concentration of $3.0 \times 10^{-6}$ M. bData were measured in a concentration of $1.0 \times 10^{-6}$ M. cThe fluorescence quantum yields ($\Phi$) were calculated using Fluorescein in 0.1N NaOH solution ($\Phi = 0.91$, excitation = 488 nm).

### Table S3 Photophysical properties of BODIPY dyes 4a-k, 5 and 7 in CH$_2$Cl$_2$ at room temperature

| dyes | $\lambda_{ab}$ | $\epsilon$ | $\lambda_{ex}$ | $\lambda_{em}$ | $\Phi^{a,c}$ | Stokes shift |
|------|----------------|------------|----------------|----------------|-------------|--------------|
|      | (nm)$^a$       | (M$^{-1}$ cm$^{-1}$) | (nm)$^b$       | (nm)$^b$       |             | (nm)         |
| 4a   | 521            | 98800      | 521            | 552            | 0.56        | 31           |
| 4b   | 523            | 60800      | 523            | 561            | 0.41        | 38           |
| 4c   | 523            | 89900      | 523            | 554            | 0.50        | 31           |
| 4e   | 527            | 57500      | 526            | 574            | 0.37        | 48           |
| 4f   | 518            | 108200     | 517            | 546            | 0.43        | 29           |
| 4g   | 522            | 101400     | 522            | 552            | 0.51        | 30           |

aData were measured in a concentration of $3.0 \times 10^{-6}$ M. bData were measured in a concentration of $1.0 \times 10^{-6}$ M. cThe fluorescence quantum yields ($\Phi$) were calculated using Fluorescein in 0.1N NaOH solution ($\Phi = 0.91$, excitation = 488 nm).
Data were measured in a concentration of $3.0 \times 10^{-6}$ M. Data were measured in a concentration of $1.0 \times 10^{-6}$ M. The fluorescence quantum yields ($\Phi$) were calculated using Rhodamine 6G in anhydrous ethanol ($\Phi = 0.95$, excitation = 530 nm).

### Table S4 Photophysical properties of BODIPY dyes 4a-k in CH$_3$CN at room temperature

| dyes | $\lambda_{abs}$ (nm)$^a$ | $\epsilon$ (M$^{-1}$·cm$^{-1}$) | $\lambda_{ex}$ (nm)$^b$ | $\lambda_{em}$ (nm)$^b$ | $\Phi_{Fa,c}^a$ | Stokes shift (nm) |
|------|----------------|----------------|----------------|----------------|--------------|-----------------|
| 4a   | 517            | 87500          | 515            | 550            | 0.53         | 35              |
| 4b   | 519            | 51600          | 518            | 557            | 0.34         | 39              |
| 4c   | 518            | 78900          | 517            | 552            | 0.52         | 35              |
| 4e   | 520            | 49100          | 519            | 570            | 0.31         | 51              |
| 4f   | 513            | 90600          | 512            | 541            | 0.25         | 29              |
| 4e   | 517            | 88200          | 516            | 549            | 0.49         | 33              |
| 4h   | 515            | 68600          | 513            | 548            | 0.55         | 35              |
| 4i   | 515            | 63000          | 515            | 550            | 0.56         | 35              |
| 4j   | 515            | 58800          | 515            | 549            | 0.86         | 34              |
| 4k   | 514            | 72100          | 513            | 546            | 0.52         | 33              |

$^a$Data were measured in a concentration of $3.0 \times 10^{-6}$ M. $^b$Data were measured in a concentration of $1.0 \times 10^{-6}$ M. $^c$The fluorescence quantum yields ($\Phi$) were calculated using Rhodamine 6G in anhydrous ethanol ($\Phi = 0.95$, excitation = 530 nm).

### Table S5 Photophysical properties of BODIPY dyes 4a-k, 5 and 7 in EtOH at room temperature

| dyes | $\lambda_{abs}$ (nm)$^a$ | $\epsilon$ (M$^{-1}$·cm$^{-1}$) | $\lambda_{ex}$ (nm)$^b$ | $\lambda_{em}$ (nm)$^b$ | $\Phi_{Fa,c}^a$ | Stokes shift (nm) |
|------|----------------|----------------|----------------|----------------|--------------|-----------------|
| 4a   | 518            | 89300          | 518            | 552            | 0.54         | 34              |
| 4b   | 520            | 51400          | 520            | 557            | 0.36         | 37              |
| 4c   | 520            | 84600          | 520            | 553            | 0.49         | 33              |
| 4e   | 523            | 54300          | 522            | 574            | 0.33         | 52              |
| 4f   | 515            | 38300          | 515            | 541            | 0.42         | 26              |
| 4e   | 518            | 58500          | 517            | 550            | 0.47         | 33              |
| 4h   | 517            | 69300          | 516            | 549            | 0.56         | 33              |
| 4i   | 518            | 62400          | 517            | 551            | 0.57         | 34              |

$^a$Data were measured in a concentration of $3.0 \times 10^{-6}$ M. $^b$Data were measured in a concentration of $1.0 \times 10^{-6}$ M. $^c$The fluorescence quantum yields ($\Phi$) were calculated using Rhodamine 6G in anhydrous ethanol ($\Phi = 0.95$, excitation = 530 nm).
Table S6 Photophysical properties of BODIPY dyes 9a-f in CH₂Cl₂ at room temperature

| dyes | λabs (nm)ᵃ | ε (M⁻¹.cm⁻¹) | λex (nm)ᵇ | λem (nm)ᵇ | ϕᵣᵃ,c | Stokes shift (nm) |
|------|------------|-------------|------------|------------|------|------------------|
| 9a   | 527        | 60200       | 524        | 606        | 0.017| 82               |
| 9b   | 528        | 44300       | 527        | 615        | 0.016| 88               |
| 9c   | 523        | 57600       | 516        | 599        | 0.022| 83               |
| 9d   | 527        | 83200       | 526        | 601        | 0.021| 75               |
| 9e   | 528        | 55300       | 527        | 602        | 0.027| 75               |
| 9f   | 515        | 48900       | 539        | 598        | 0.11 | 59               |

ᵃData were measured in a concentration of 3.0 × 10⁻⁶ M. ᵇData were measured in a concentration of 1.0 × 10⁻⁶ M. ᶜThe fluorescence quantum yields (Φ) were calculated using Rhodamine 6G in anhydrous ethanol (Φ = 0.95, excitation = 530 nm).

Table S7 Photophysical properties of BODIPY dyes 9a-f in EtOH at room temperature

| dyes | λabs (nm)ᵃ | ε (M⁻¹.cm⁻¹) | λex (nm)ᵇ | λem (nm)ᵇ | ϕᵣᵃ,c | Stokes shift (nm) |
|------|------------|-------------|------------|------------|------|------------------|
| 9a   | 523        | 50300       | 521        | 606        | 0.011| 85               |
| 9b   | 525        | 38200       | 523        | 618        | 0.010| 95               |
| 9c   | 523        | 52200       | 512        | 598        | 0.013| 86               |
| 9d   | 523        | 70300       | 522        | 603        | 0.014| 81               |
| 9e   | 525        | 47100       | 522        | 603        | 0.016| 81               |
| 9f   | 513        | 45200       | 539        | 596        | 0.096| 57               |

ᵃData were measured in a concentration of 3.0 × 10⁻⁶ M. ᵇData were measured in a concentration of 1.0 × 10⁻⁶ M. ᶜThe fluorescence quantum yields (Φ) were calculated using Rhodamine 6G in anhydrous ethanol (Φ = 0.95, excitation = 530 nm).

Figure S1: Fluorescent emission spectra of dye 3a in different solvents (CH₂Cl₂, CH₂CN and EtOH, 5.0 × 10⁻⁶ M, excited at λₘₐₓ, respectively)
Figure S2: Absorbance spectra of dye 3a in different solvents (CH$_2$Cl$_2$, CH$_3$CN and EtOH, 1.0 × 10$^{-6}$ M)

Figure S3: Fluorescent Emission spectra of 3a, 3e, 3g, and 4l in CH$_2$Cl$_2$ (5.0 × 10$^{-6}$ M, excited at their $\lambda_{\text{max}}$, respectively)

Figure S4: Absorbance spectra of 3a, 3e, 3g and 4l in CH$_2$Cl$_2$ (1.0 × 10$^{-6}$ M)
Figure S5: Fluorescent Emission spectra of 6a-e in EtOH (5.0 × 10⁻⁶ M, excited at their λ<sub>max</sub>, respectively)

Figure S6: Absorbance spectra of 6a-e in EtOH (1.0 × 10⁻⁶ M)
Figure S7. Morphological changes of MDA-MB-231 cells after laser irradiation in presence of solvent control (Column 1), compound 6a (Column 2 and 3), 6b (Column 4 and 5) and 6f (Column 6 and 7), respectively. Three compounds (6a, 6b and 6f) were added to MDA-MB-231 cells with two different concentrations (2.5 μM and 5.0 μM) respectively. During the period of laser irradiation for 10 min, fluorescent images (showing the presence of the compound in cells) and brightfield images were acquired at 0 min (Row 1 and 2), 5 min (Row 3 and 4) and 10 min (Row 5 and 6). Blue boxes, laser irradiated regions; Scale bar: 50 μm.

Reference:

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4. $^1$H and $^{13}$C NMR Spectra
OTf

SA19

H_2CO_2

7.45
7.47
7.33
7.26
7.19
7.15
6.93
6.40

2.64
2.38
1.63
0.00

12.0 11.5 11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1.0
9a
