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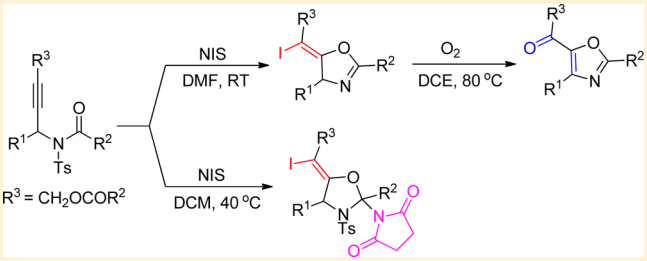
# From Propargylamides to Oxazole Derivatives: NIS-Mediated Cyclization and Further Oxidation by Dioxygen

Yancheng Hu, Ruxia Yi, Chunxiang Wang, Xiaoyi Xin, Fan Wu, and Boshun Wan*

Dalian Institute of Chemical Physics, Chinese Academy of Sciences, 457 Zhongshan Road, Dalian 116023, People's Republic of China

Supporting Information

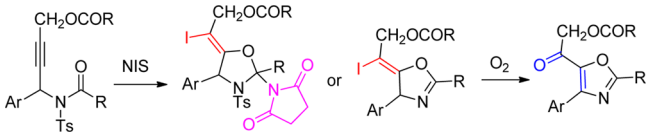
**ABSTRACT:** NIS-mediated iodocyclization of *N*-sulfonyl propargylamides for the synthesis of various oxazolidines and iodoalkylidenedihydrooxazoles via a 5-*exo*-*dig* process is developed. The resulting iodoalkylidenedihydrooxazoles can be further transformed into the corresponding oxazoles in the presence of dioxygen.




## INTRODUCTION

Propargylamides have been well studied as versatile and effective building blocks for the synthesis of oxazoles in the past decade,[1−5] which occur in a wide range of bioactive natural products, synthetic intermediates, and pharmaceuticals.[6] As a consequence, the cyclization of propargylamides has gained considerable attention and significant progress has been made in this area. In 2001, Cacchi and co-workers reported the first Pd-catalyzed coupling−cyclization sequence for the synthesis of oxazoles.[2a] Along with remarkable improvements in gold catalysis, Hashmi and co-workers have made great contributions to the gold-catalyzed cyclization of propargylamides.[3] On the basis of these findings, the transformation of propargylamides has been successfully realized with other transition-metal catalysts[4] or under basic conditions[5] to date. Therefore, the exploration of more efficient and environmentally benign alternatives for the synthesis of oxazole derivatives is still highly desirable. As is known, electrophilic iodocyclization of alkynes has emerged as a very effective approach for the construction of a variety of carbocyclic and heterocyclic ring systems.[7] The resulting halides can undergo other useful transformations, transition-metal-catalyzed cross couplings in particular, which makes them extremely versatile building blocks in organic synthesis. Very recently, we have reported the silver- and base-catalyzed cyclization of *N*-sulfonyl propargylamides into oxazoles via sulfonyl migration.[8] As a continuation of our interest in the cyclization of *N*-sulfonyl propargylamides, we envisioned that iodonium-triggered electrophilic cyclization of propargylamides would give some significant finding. Herein, we report the halogen-mediated regioselective cyclization of *N*-sulfonyl propargylamides to provide various halogen-containing oxazole derivatives through an intramolecular 5-*exo*-*dig* process, which can be further transformed into the corresponding oxazoles in the presence of dioxygen (Scheme 1).

**Scheme 1. Our Studies on the Cyclization of Propargylamides**




## RESULTS AND DISCUSSION

Our initial studies were carried out with *N*-tosyl propargylamide **1a** as the substrate and *N*-iodosuccinimide (NIS) as the iodine source. Surprisingly, when substrate **1a** was submitted to the iodocyclization conditions in the presence of NIS in dichloromethane (DCM) at room temperature, polyfunctionalized oxazolidine **2a** with an exocyclic double bond and a quaternary carbon atom was obtained as the only product (62% yield). The formation of **2a** was unambiguously confirmed by X-ray crystallography.[9] After a brief optimization process, including the solvents, additives, and temperatures, we observed that the desired product **2a** was afforded in an acceptable yield with 1.2 equiv of NIS in dichloromethane at 40 °C (see the Supporting Information). It is noteworthy that iodoalkylidenedihydrooxazole **3a**, instead of oxazolidine **2a**, was found to be the only product (83% yield) when the solvent was changed to *N*,*N*′-dimethylformamide (DMF). Therefore, this reaction provided an appealing alternative for the synthesis of diversified dihydrooxazoles **3**.

With these results in hand, we further explored the substrate scope of both iodocyclization reactions and the results are shown in Table 1. For the $R^2$ groups, phenyl rings with both electron-withdrawing and electron-donating substituents were well tolerated, providing the desired oxazole derivatives **2** and **3**

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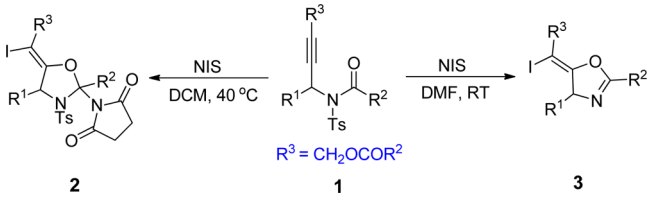
**Table 1. NIS-Mediated Cyclization of *N*-Tosyl Propargylamides in DCM and DMF[a]**




| entry | 1 | $R^1$, $R^2$ | yield, % 2 | yield, % 3 |
|---|---|---|---|---|
| 1 | **1a** | $C_6H_5$, $C_6H_5$ | 77 (**2a**) | 83 (**3a**) |
| 2 | **1b** | $C_6H_5$, *m*-F-$C_6H_4$ | 86 (**2b**) | 67 (**3b**) |
| 3 | **1c** | $C_6H_5$, *p*-Me-$C_6H_4$ | 82 (**2c**) | 65 (**3c**) |
| 4 | **1d** | $C_6H_5$, *p*-OMe-$C_6H_4$ | 80 (**2d**) | 59 (**3d**) |
| 5 | **1e** | $C_6H_5$, *p*-Cl-$C_6H_4$ | 80 (**2e**) | 56 (**3e**) |
| 6 | **1f** | $C_6H_5$, OEt | 38 (**2f**) | 0 (**3f**) |
| 7 | **1g** | $C_6H_5$, cyclopentyl | **0** (**2g**) | **0** (**3g**) |
| 8 | **1h** | *o*-F-$C_6H_4$, $C_6H_5$ | 84 (**2h**) | 83 (**3h**) |
| 9 | **1i** | *m*-F-$C_6H_4$, $C_6H_5$ | 94 (**2i**) | 80 (**3i**) |
| 10 | **1j** | *p*-Br-$C_6H_4$, $C_6H_5$ | 85 (**2j**) | 38 (**3j**) |
| 11 | **1k** | 2-naphthyl, $C_6H_5$ | 88 (**2k**) | 82 (**3k**) |
| 12 | **1l** | 2-furyl, $C_6H_5$ | 0 (**2l**) | 0 (**3l**) |

[a]The reactions were carried out with **1** (0.20 mmol) and NIS (1.2 eqiuv) in solvent (3.0 mL) for 2−12 h, unless otherwise stated.

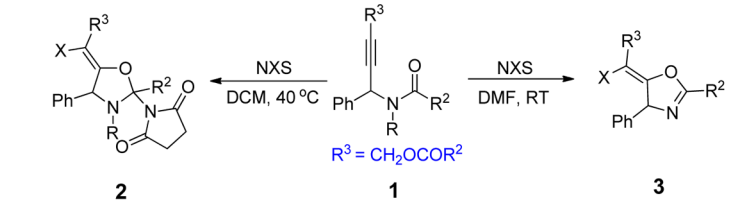
in moderate to good yields (Table 1, entries 1−5). Unfortunately, the ethoxyl-substituted substrate **1f** afforded the iodocyclization product **2f** only in 38% yield, and the desired dihydrooxazole **3f** was not observed under the standard conditions. When another aliphatic moiety such as cyclopentyl was employed as $R^2$, both reactions failed to undergo the cyclization, probably due to the electronic nature of aliphatic substituents (Table 1, entry 7). Meanwhile, other functional groups such as −F and −Br in aromatic $R^1$ substituents were also compatible in these two iodocyclization reactions and afforded the corresponding products **2** and **3** in satisfactory yields (Table 1, entries 8−10). Notably, these two cyclization reactions with naphthyl-derived substrate **1k** proceeded well, whereas furyl substrate **1l** gave no desired products **2l** and **3l**. However, when we tried to prepare 2-pyridyl substrate, we failed to obtain the desired substrate.

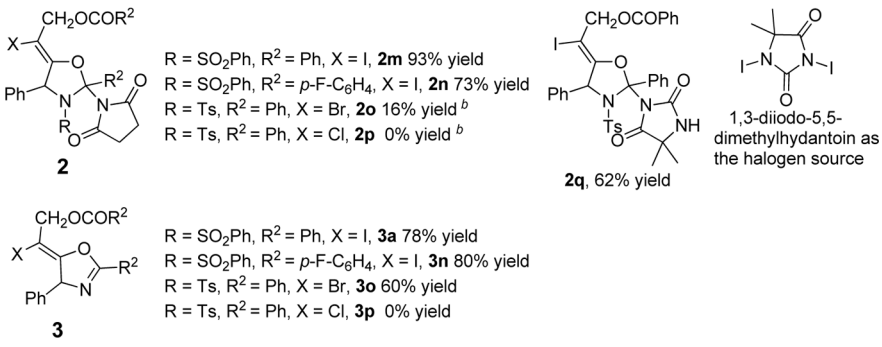
Likewise, the scope of sulfonyl group in the substrate and effects of other halogen sources were also examined. As summarized in Scheme 2, *N*-phenylsulfonyl substrates were also suitable for these two iodocyclization reactions, giving the corresponding products **2** and **3** in 73−93% yield. When we tried to prepare a more electron withdrawing sulfonyl substrate such as the 2-nitrobenzenesulfonyl group, unfortunately, we failed to obtain the desired substrate according to our reported method. Moreover, *N*-bromosuccinimide (NBS) could also trigger the cyclization of substrate **1a**, albeit with lower yields (**2o**, 16%; **3o**, 60%). However, no products (**2p** and **3p**) were detected with *N*-chlorosuccinimide (NCS) as the halogen source. These results could be explained by taking account into the lower activity of NBS and NCS, increasing the activation energy needed to start the cyclization process. To our delight, treatment of **1a** with 1,3-diiodo-5,5-dimethylhydantoin afforded the desired oxazolidine **2q** in 62% yield.

A plausible mechanism for the above two iodocyclization reactions is depicted in Scheme 3. The reaction is initiated by the coordination of **1** with $I^+$, thereby enhancing the electrophilicity of the alkyne moiety to generate intermediate **A**. The activated triple bond then undergoes nucleophilic attack by the carbonyl oxygen to form intermediate **B** via a 5-*exo-dig* cyclization mode. Two different pathways are followed in the next reaction step on the basis of the choice of solvents. In DCM, the succinimide anion attacks the more electrophilic carbon of the iminium ion to furnish the final product **2**. In contrast, the succinimide anion traps the tosyl group of intermediate **B** to give the desired product **3** when the reaction is carried out in the more polar solvent DMF.

To illustrate the synthetic potential of halogen-containing heterocycles produced in these two cyclization reactions, additional studies were conducted on their further trans-

**Scheme 2. Scope of Sulfonyl Group and Effects of the Halogen Source[a]**




[a]The reactions were carried out with **1** (0.20 mmol) and halogen source (1.2 eqiuv) in solvent (3.0 mL) for 2−12 h, unless otherwise stated. [b]80 °C in DCE for 18 h.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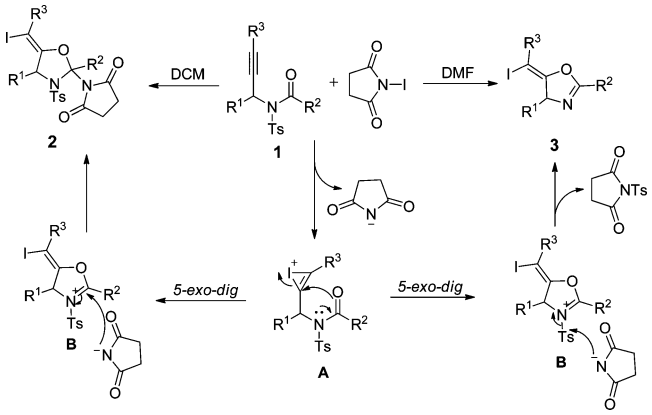
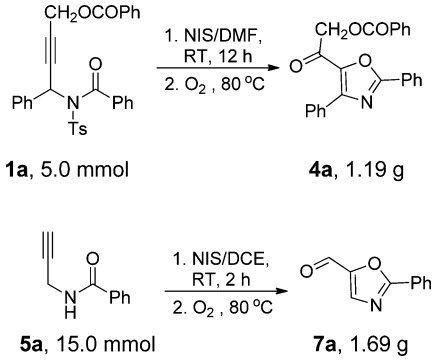
**Scheme 3. Proposed Mechanism for the Cyclization of *N*-Sulfonyl Propargylamide**




**Scheme 5. One-Pot and Gram-Scale Synthesis of Oxazoles 4a and 7a**




formations. Gratifyingly, we found that iodoalkylidene-dihydrooxazole **3a** could be efficiently converted into functionalized oxazole **4a** just in the presence of dioxygen (1 atm). To the best of our knowledge, there has been no report on the oxidation of iodoalkylidenedihydrooxazoles before. Thus, the substrate scope was investigated (Scheme 4). The results revealed that various dihydrooxazoles **3** underwent the oxidation reaction smoothly, giving the corresponding oxazoles in acceptable yields (70−80%). Furthermore, iodoalkylidene-dihydrooxazoles **6**, which were generated from NIS-induced cyclization of structurally simpler propargylamides **5**,[3b] could also participate in this reaction and produce oxazole-5-carbaldehydes **7** in good yields. However, the oxidation reactions of oxazolidine **2** did not take place under the same conditions.

On the basis of the above results, we then tried to combine the formation and oxidation of iodoalkylidenedihydrooxazoles **3** and **6** in one pot by adding dioxygen after NIS-triggered cyclization of propargylamides **1** and **5** (Scheme 5). Thus, the two-step one-pot reaction was accomplished successfully. Additionally, the gram scale reactions were performed in a one-pot sequence, affording the desired oxazoles **4a** and **7a** in 62% and 65% yields, respectively.

Mechanistically (Scheme 6),[3e,10] the radical intermediate **C** and an iodine radical are formed by homolytic cleavage of the C−I bond under heat conditions. Intermediate **C** then would quickly react with oxygen to give the peroxyl radical species **D**, followed by a six-membered-ring transition state to give the radical species **E**, which is a resonance structure of **F**. Species **F** releases a hydroxyl radical to afford the final product **4**. The combination of iodine radicals and hydroxyl radicals results in the formation of HIO, which can easily decompose into oxygen, iodine, and water.

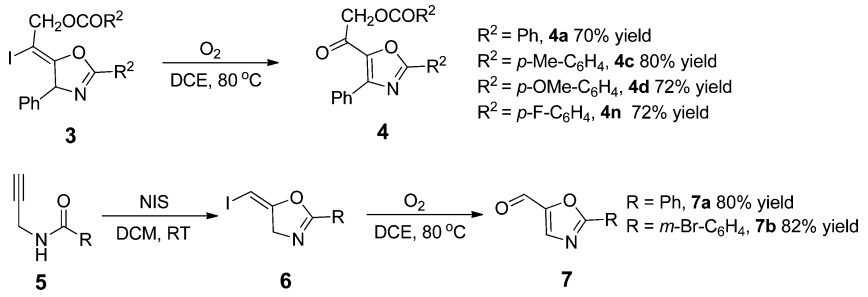
## CONCLUSION

In summary, we have developed a NIS-mediated cyclization of *N*-sulfonyl propargylamides for the synthesis of various functionalized oxazolidines and iodoalkylidenedihydrooxazoles via a 5-*exo*-*dig* process. Moreover, the resulting iodoalkylidene-dihydrooxazoles can be further transformed into the corresponding oxazoles in the presence of oxygen. This oxidation reaction may serve as a powerful tool for the rapid and efficient transformations of other halogen-containing heterocycles. Futhermore, this process may find applications in the synthesis of complex structures.

## EXPERIMENTAL SECTION

**General Information.** Unless otherwise stated, all reactions and manipulations were carried out under an argon atmosphere using standard Schlenk techniques or in an argon-filled glovebox. All chemicals were obtained from commercial sources and were used without further purification. Solvents were treated prior to use according to the standard methods. Column chromatography was carried out on silica gel (300−400 mesh) using a forced flow of eluent at 0.3−0.5 bar pressure. NMR spectra were recorded at room temperature in $CDCl_3$ on 400 and 500 MHz spectrometers. The chemical shifts for $^1H$ NMR were recorded in ppm downfield from tetramethylsilane (TMS) with $CDCl_3$ (7.26 ppm) as the internal standard. The chemical shifts for $^{13}C$ NMR were recorded in ppm downfield using the central peak of $CDCl_3$ (77.16 ppm) as the internal standard. Coupling constants (*J*) are reported in hertz and refer to apparent peak multiplications.

**Scheme 4. Oxidation of Iodoalkylidenedihydrooxazole[a]**




[a]The reactions were carried out with **3** or **6** (0.20 mmol) in $O_2$ atmosphere and DCE (2.0 mL) at 80 °C, unless otherwise stated.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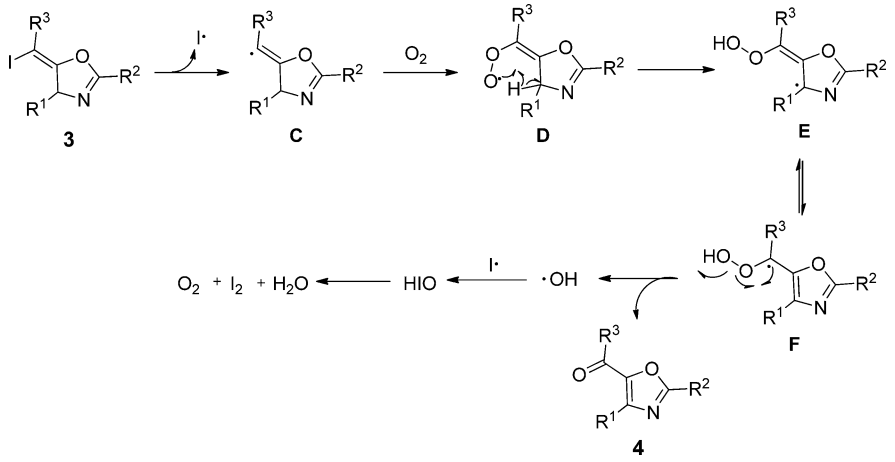
**Scheme 6. Proposed Mechanism for the Oxidation of Iodoalkylidenedihydrooxazole**




**Characterization of Starting Materials.** The *N*-sulfonyl propargylamides were prepared following the procedure described in the literature.[8b] **1a−c,e−l** are known compounds.[8b]

*4-(4-Methyl-N-tosylbenzamido)-4-phenylbut-2-yn-1-yl 4-Methoxybenzoate (**1d**).* By following the known procedure (0.40 mmol), the compound was obtained as a white solid: 170.1 mg, 71% yield, mp 112−113 °C. $^1$H NMR (500 MHz, acetone): $\delta$ 8.06 (d, $J$ = 8.7 Hz, 2H), 7.77 (d, $J$ = 8.3 Hz, 2H), 7.44 (d, $J$ = 8.6 Hz, 4H), 7.36 (d, $J$ = 8.2 Hz, 2H), 7.30−7.23 (m, 3H), 7.09 (d, $J$ = 8.7 Hz, 2H), 6.80 (d, $J$ = 8.7 Hz, 2H), 6.34 (s, 1H), 5.04 (d, $J$ = 1.6 Hz, 2H), 3.90 (s, 3H), 3.78 (s, 3H), 2.40 (s, 3H). $^{13}$C NMR (126 MHz, acetone): $\delta$ 170.1, 164.9, 163.9, 162.9, 144.8, 136.5, 135.9, 131.6, 131.0, 129.3, 128.7, 128.2, 128.1, 127.9, 127.4, 121.9, 113.9, 113.2, 82.15, 82.12, 55.1, 54.9, 53.7, 52.0, 20.6. HRMS (ESI-TOF): $m/z$ calcd for $C_{34}H_{32}NO_7NaS$ $[M + Na]^+$ 621.1797, found 621.1803.

**Representative Procedure for the Synthesis of Oxazolidines 2.** In a 10 mL flame-dried Schlenk, *N*-sulfonyl propargylamide **1** (0.20 mmol) and halogen source (1.2 equiv) were introduced under argon and dissolved in 2 mL of dry and degassed dichloromethane. The resulting yellow solution was stirred at 40 °C for 2−3 h and quenched with sodium thiosulfate solution. The aqueous layer was extracted with $Et_2O$, and the combined organic layers were washed twice with brine, dried over $MgSO_4$, filtered, and concentrated under reduced pressure. Purification by flash chromatography on silica gel (petroleum ether/EtOAc: 2/1) afforded the expected product.

*(E)-2-(2-(2,5-Dioxopyrrolidin-1-yl)-2,4-diphenyl-3-tosyloxazolidin-5-ylidene)-2-iodoethyl Benzoate (**2a**).* By following the general procedure (0.20 mmol), the compound was obtained as a white solid: 115.3 mg, 77% yield, mp 192−193 °C. $^1$H NMR (500 MHz, $CDCl_3$): $\delta$ 7.99−7.92 (m, 2H), 7.70−7.26 (m, 13H), 6.55−6.45 (m, 2H), 5.96 (d, $J$ = 1.5 Hz, 1H), 5.89−5.79 (m, 2H), 5.62 (d, $J$ = 12.6 Hz, 1H), 4.30 (dd, $J$ = 12.6, 1.6 Hz, 1H), 3.20−2.64 (m, 4H), 2.15 (s, 3H). $^{13}$C NMR (126 MHz, $CDCl_3$): $\delta$ 176.7, 175.5, 165.8, 153.7, 142.2, 138.3, 136.0, 133.4, 133.2, 131.0, 130.0, 129.6, 129.5, 128.6, 128.5, 128.4, 128.1, 126.4, 102.1, 74.1, 68.9, 64.5, 29.6, 28.3, 21.2. HRMS (ESI-TOF): $m/z$ calcd for $C_{35}H_{29}N_2O_7NaSI$ $[M + Na]^+$ 771.0638, found 771.0620.

*(E)-2-(2-(2,5-Dioxopyrrolidin-1-yl)-2-(3-fluorophenyl)-4-phenyl-3-tosyloxazolidin-5-ylidene)-2-iodoethyl 3-Fluorobenzoate (**2b**).* By following the general procedure (0.20 mmol), the compound was obtained as a white solid: 135.8 mg, 86% yield, mp 119−120 °C. $^1$H NMR (500 MHz, $CDCl_3$): $\delta$ 7.85−7.71 (m, 1H), 7.62 (ddd, $J$ = 9.2, 2.5, 1.5 Hz, 1H), 7.53−7.20 (m, 10H), 7.09 (t, $J$ = 7.5 Hz, 1H), 6.56 (d, $J$ = 8.1 Hz, 2H), 5.97 (s, 3H), 5.61 (d, $J$ = 12.6 Hz, 1H), 4.32 (dd, $J$ = 12.6, 1.5 Hz, 1H), 3.37−2.61 (m, 4H), 2.17 (s, 3H). $^{13}$C NMR (126 MHz, $CDCl_3$): $\delta$ 176.5, 175.6, 164.89, 164.87, 162.7 (d, $J$ = 247.5 Hz), 153.8, 142.7, 138.2, 136.0, 132.2 (d, $J$ = 7.4 Hz), 131.0, 130.3 (d, $J$ = 7.7 Hz), 128.8, 128.6, 128.3, 126.4, 125.5 (d, $J$ = 2.7 Hz), 120.4 (d, $J$ = 21.3 Hz), 116.6 (d, $J$ = 23.1 Hz), 116.6 (d, $J$ = 21.1 Hz), 101.3, 73.6, 69.1, 64.9, 29.4, 28.4, 21.3. HRMS (ESI-TOF): $m/z$ calcd for $C_{35}H_{27}N_2O_7F_2NaSI$ $[M + Na]^+$ 807.0450, found 807.0463.

*(E)-2-(2-(2,5-Dioxopyrrolidin-1-yl)-4-phenyl-2-(p-tolyl)-3-tosyloxazolidin-5-ylidene)-2-iodoethyl 4-Methylbenzoate (**2c**).* By following the general procedure (0.20 mmol), the compound was obtained as a white solid: 128.0 mg, 82% yield, mp 200−201 °C. $^1$H NMR (400 MHz, $CDCl_3$): $\delta$ 7.84 (d, $J$ = 8.0 Hz, 2H), 7.59−7.01 (m, 11H), 6.50 (d, $J$ = 8.2 Hz, 2H), 5.94 (s, 1H), 5.89 (d, $J$ = 8.2 Hz, 2H), 5.59 (d, $J$ = 12.6 Hz, 1H), 4.28 (d, $J$ = 12.5 Hz, 1H), 2.99−2.75 (m, 4H), 2.40 (s, 3H), 2.38 (s, 3H), 2.16 (s, 3H). $^{13}$C NMR (126 MHz, $CDCl_3$): $\delta$ 177.0, 175.7, 165.8, 153.6, 144.0, 142.1, 139.7, 138.4, 136.1, 131.0, 130.5, 129.7, 129.2, 128.6, 128.4, 127.9, 127.3, 126.5, 102.2, 74.6, 68.8, 64.3, 29.5, 28.3, 21.8, 21.33, 21.28. HRMS (ESI-TOF): $m/z$ calcd for $C_{37}H_{33}N_2O_7NaSI$ $[M + Na]^+$ 799.0951, found 799.0960.

*(E)-2-(2-(2,5-Dioxopyrrolidin-1-yl)-2-(4-methoxyphenyl)-4-phenyl-3-tosyloxazolidin-5-ylidene)-2-iodoethyl 4-Methoxybenzoate (**2d**).* By following the general procedure (0.20 mmol), the compound was obtained as a white solid: 129.1 mg, 80% yield, mp 166−167 °C. $^1$H NMR (500 MHz, $CDCl_3$): $\delta$ 7.91 (d, $J$ = 8.9 Hz, 2H), 7.49 (d, $J$ = 7.1 Hz, 4H), 7.39−7.29 (m, 3H), 7.08−6.65 (m, 4H), 6.54 (d, $J$ = 8.2 Hz, 2H), 5.93−5.91 (m, 3H), 5.58 (d, $J$ = 12.6 Hz, 1H), 4.26 (dd, $J$ = 12.6, 1.5 Hz, 1H), 3.86 (s, 3H), 3.84 (s, 3H), 3.21−2.68 (m, 4H), 2.17 (s, 3H). $^{13}$C NMR (126 MHz, $CDCl_3$): $\delta$ 177.0, 175.6, 165.5, 163.7, 160.7, 153.53, 153.47, 142.2, 138.6, 136.3, 131.8, 131.1, 128.6, 128.5, 128.1, 126.6, 125.6, 122.6, 113.9, 113.0, 102.3, 74.8, 68.9, 64.2, 55.6, 29.7, 28.5, 21.3. HRMS (ESI-TOF): $m/z$ calcd for $C_{37}H_{33}N_2O_9NaSI$ $[M + Na]^+$ 831.0849, found 831.0832.

*(E)-2-(2-(4-Chlorophenyl)-2-(2,5-dioxopyrrolidin-1-yl)-4-phenyl-3-tosyloxazolidin-5-ylidene)-2-iodoethyl 4-Chlorobenzoate (**2e**).* By following the general procedure (0.20 mmol), the compound was obtained as a white solid: 130.3 mg, 80% yield, mp 214−215 °C. $^1$H NMR (500 MHz, $CDCl_3$): $\delta$ 8.06−7.79 (m, 2H), 7.59−7.29 (m, 10H), 7.21 (s, 1H), 6.59 (d, $J$ = 8.1 Hz, 2H), 5.96 (d, $J$ = 1.4 Hz, 1H), 5.93 (d, $J$ = 8.4 Hz, 2H), 5.59 (d, $J$ = 12.6 Hz, 1H), 4.31 (dd, $J$ = 12.6, 1.6 Hz, 1H), 3.01−2.78 (m, 4H), 2.19 (s, 3H). $^{13}$C NMR (126 MHz, $CDCl_3$): $\delta$ 176.8, 175.6, 165.1, 153.7, 142.7, 139.9, 138.2, 136.1, 135.9, 132.15, 131.12, 131.0, 129.0, 128.9, 128.6, 128.5, 128.3, 126.4, 101.6, 74.0, 69.0, 64.7, 29.5, 28.5, 21.4. HRMS (ESI-TOF): $m/z$ calcd for $C_{35}H_{27}N_2O_7Cl_2NaSI$ $[M + Na]^+$ 838.9858, found 838.9840.

*(E)-2-(2-(2,5-Dioxopyrrolidin-1-yl)-2-ethoxy-4-phenyl-3-tosyloxazolidin-5-ylidene)-2-iodoethyl Ethyl Carbonate (**2f**).* By following the general procedure (0.20 mmol), the compound was obtained as a white solid: 50.7 mg, 38% yield, mp 102−103 °C. $^1$H NMR (500 MHz, $CDCl_3$): $\delta$ 7.35−7.27 (m, 3H), 7.19 (t, $J$ = 7.6 Hz, 2H), 6.98 (d, $J$ = 8.4 Hz, 2H), 6.86 (d, $J$ = 8.2 Hz, 2H), 5.85 (s, 1H), 5.01 (d, $J$ = 12.5 Hz, 1H), 4.77 (d, $J$ = 12.3 Hz, 1H), 4.15 (q, $J$ = 7.1 Hz, 2H), 3.86 (dq, $J$ = 8.6, 7.0 Hz, 1H), 3.71 (dq, $J$ = 8.7, 7.0 Hz, 1H), 2.76 (s, 4H), 2.28 (s, 3H), 1.27 (t, $J$ = 7.1 Hz, 3H), 1.19 (t, $J$ = 7.0 Hz, 3H). $^{13}$C NMR (126 MHz, $CDCl_3$): $\delta$ 154.8, 153.8, 143.3, 137.3, 135.5, 131.0, 128.6, 128.4, 128.3, 128.1, 113.8, 69.0, 68.2, 65.4, 64.3, 62.8, 28.6, 21.6,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14.4, 14.3. HRMS (ESI-TOF): $m/z$ calcd for $C_{27}H_{29}N_2O_9NaSI$ $[M + Na]^+$ 707.0536, found 707.0543.

*(E)-2-(2-(2,5-Dioxopyrrolidin-1-yl)-4-(2-fluorophenyl)-2-phenyl-3-tosyloxazolidin-5-ylidene)-2-iodoethy Phenyl Carbonate (**2h**).* By following the general procedure (0.20 mmol), the compound was obtained as a white solid: 129.6 mg, 84% yield, mp 188−189 °C. $^1H$ NMR (500 MHz, $CDCl_3$): $\delta$ 8.04−7.83 (m, 2H), 7.64 (d, $J$ = 7.5 Hz, 2H), 7.59−7.52 (m, 1H), 7.47−7.32 (m, 6H), 7.07−7.03 (m, 2H), 6.54 (d, $J$ = 8.2 Hz, 2H), 6.09 (s, 1H), 5.88 (s, 2H), 5.62 (d, $J$ = 12.6 Hz, 1H), 4.31 (dd, $J$ = 12.6, 1.6 Hz, 1H), 3.00−2.84 (m, 4H), 2.16 (s, 3H). $^{13}C$ NMR (126 MHz, $CDCl_3$): $\delta$ 176.2, 165.8, 161.7 (d, $J$ = 252.3 Hz), 152.7, 142.4, 138.3, 133.4, 133.2, 130.9 (d, $J$ = 8.1 Hz), 130.1, 129.7, 129.5, 128.9, 128.5, 128.3, 128.0, 126.2, 124.1, 122.9, 115.9 (d, $J$ = 21.4 Hz), 102.6, 72.5, 64.7, 28.9, 21.3. HRMS (ESI-TOF): $m/z$ calcd for $C_{35}H_{28}FN_2O_7NaSI$ $[M + Na]^+$ 789.0544, found 789.0537.

*(E)-2-(2-(2,5-Dioxopyrrolidin-1-yl)-4-(3-fluorophenyl)-2-phenyl-3-tosyloxazolidin-5-ylidene)-2-iodoethyl Phenyl Carbonate (**2i**).* By following the general procedure (0.20 mmol), the compound was obtained as a light yellow solid: 142.4 mg, 94% yield, mp 200−201 °C. $^1H$ NMR (400 MHz, $CDCl_3$): $\delta$ 7.96 (d, $J$ = 7.4 Hz, 2H), 7.57 (t, $J$ = 7.4 Hz, 3H), 7.49−7.26 (m, 7H), 7.11 (d, $J$ = 9.5 Hz, 1H), 7.04 (t, $J$ = 8.0 Hz, 1H), 6.56 (d, $J$ = 8.2 Hz, 2H), 5.93 (d, $J$ = 8.6 Hz, 3H), 5.61 (d, $J$ = 12.6 Hz, 1H), 4.31 (dd, $J$ = 12.6, 1.2 Hz, 1H), 3.01− 2.76 (m, 4H), 2.17 (s, 3H). $^{13}C$ NMR (126 MHz, $CDCl_3$): $\delta$ 176.6, 175.8, 165.9, 162.8 (d, $J$ = 246.9 Hz), 153.1, 142.6, 138.4 (d, $J$ = 6.9 Hz), 138.3, 133.4, 133.3, 130.0, 129.9 (d, $J$ = 8.0 Hz), 129.7, 128.6, 128.2, 127.1, 126.4, 117.6 (d, $J$ = 22.0 Hz), 115.7 (d, $J$ = 21.2 Hz), 74.7, 68.3, 64.5, 29.6, 28.4, 21.3. HRMS (ESI-TOF): $m/z$ calcd for $C_{35}H_{28}FN_2O_7NaSI$ $[M + Na]^+$ 789.0544, found 789.0551.

*(E)-2-(4-(4-Bromophenyl)-2-(2,5-dioxopyrrolidin-1-yl)-2-phenyl-3-tosyloxazolidin-5-ylidene)-2-iodoethyl Phenyl Carbonate (**2j**).* By following the general procedure (0.20 mmol), the compound was obtained as a white solid: 141.2 mg, 85% yield, mp 127−128 °C. $^1H$ NMR (500 MHz, $CDCl_3$): $\delta$ 8.13−7.79 (m, 2H), 7.73−7.49 (m, 3H), 7.54−7.29 (m, 9H), 6.58 (d, $J$ = 8.1 Hz, 2H), 5.90 (d, $J$ = 8.4 Hz, 3H), 5.61 (d, $J$ = 12.6 Hz, 1H), 4.30 (dd, $J$ = 12.6, 1.6 Hz, 1H), 3.02−2.77 (m, 4H), 2.20 (s, 3H). $^{13}C$ NMR (126 MHz, $CDCl_3$): $\delta$ 176.4, 175.7, 165.8, 153.1, 142.6, 138.3, 135.1, 133.5, 133.3, 132.5, 131.6, 129.9, 129.6, 128.5, 128.4, 128.2, 126.3, 122.8, 102.2, 74.4, 68.2, 64.4, 28.5, 28.1, 21.3. HRMS (ESI-TOF): $m/z$ calcd for $C_{35}H_{28}BrN_2O_7NaSI$ $[M + Na]^+$ 848.9743, found 848.9760.

*(E)-2-(2-(2,5-Dioxopyrrolidin-1-yl)-4-(naphthalen-2-yl)-2-phenyl-3-tosyloxazolidin-5-ylidene)-2-iodoethyl Phenyl Carbonate (**2k**).* By following the general procedure (0.20 mmol), the compound was obtained as a white solid: 140.6 mg, 88% yield, mp 157−158 °C. $^1H$ NMR (500 MHz, $CDCl_3$): $\delta$ 8.01 (s, 1H), 7.99−7.92 (m, 2H), 7.88−7.75 (m, 2H), 7.69 (d, $J$ = 8.2 Hz, 3H), 7.60−7.48 (m, 3H), 7.44 (dt, $J$ = 7.5, 3.8 Hz, 6H), 6.19 (d, $J$ = 8.1 Hz, 2H), 6.11 (d, $J$ = 1.2 Hz, 1H), 5.73 (d, $J$ = 8.4 Hz, 2H), 5.66 (d, $J$ = 12.5 Hz, 1H), 4.31 (dd, $J$ = 12.5, 1.6 Hz, 1H), 3.00−2.82 (m, 4H), 2.00 (s, 3H). $^{13}C$ NMR (126 MHz, $CDCl_3$): $\delta$ 176.2, 165.8, 153.4, 142.1, 138.2, 133.7, 133.2, 133.2, 132.9, 132.8, 131.7, 130.0, 129.7, 129.6, 128.5, 128.4, 128.3, 127.8, 127.6, 126.7, 126.33, 126.27, 102.2, 74.1, 69.1, 64.6, 28.7, 21.1. HRMS (ESI-TOF): $m/z$ calcd for $C_{39}H_{31}N_2O_7NaSI$ $[M + Na]^+$ 821.0794, found 821.0791.

*(E)-2-(2-(2,5-Dioxopyrrolidin-1-yl)-2,4-diphenyl-3-(phenylsulfonyl)oxazolidin-5-ylidene)-2-iodoethyl Phenyl Carbonate (**2m**).* By following the general procedure (0.20 mmol), the compound was obtained as a white solid: 136.6 mg, 93% yield, mp 188−189 °C. $^1H$ NMR (500 MHz, $CDCl_3$): $\delta$ 8.07−7.86 (m, 2H), 7.70−7.29 (m, 13H), 7.08 (t, $J$ = 7.4 Hz, 1H), 6.71 (dd, $J$ = 8.3, 7.6 Hz, 2H), 5.99−5.95 (m, 3H), 5.63 (d, $J$ = 12.6 Hz, 1H), 4.29 (dd, $J$ = 12.6, 1.6 Hz, 1H), 3.03−2.79 (m, 4H). $^{13}C$ NMR (126 MHz, $CDCl_3$): $\delta$ 176.8, 175.6, 165.8, 153.5, 141.0, 135.9, 133.3, 133.2, 131.4, 130.9, 130.0, 129.6, 129.5, 128.6, 128.5, 128.4, 128.0, 127.4, 126.4, 126.2, 102.1, 74.3, 68.9, 64.4, 29.4, 28.4. HRMS (ESI-TOF): $m/z$ calcd for $C_{34}H_{27}N_2O_7NaSI$ $[M + Na]^+$ 757.0481, found 757.0466.

*(E)-2-(2-(2,5-Dioxopyrrolidin-1-yl)-2-(4-fluorophenyl)-4-phenyl-3-(phenylsulfonyl)oxazolidin-5-ylidene)-2-iodoethyl 4-Fluorobenzoate (**2n**).* By following the general procedure (0.20 mmol), the compound was obtained as a white solid: 112.6 mg, 73% yield, mp 204−205 °C. $^1H$ NMR (400 MHz, $CDCl_3$): $\delta$ 7.97 (dd, $J$ = 8.8, 5.4 Hz, 2H), 7.67−7.43 (m, 4H), 7.42−7.28 (m, 3H), 7.20−6.69 (m, 7H), 6.07 (d, $J$ = 7.5 Hz, 2H), 5.97 (d, $J$ = 1.2 Hz, 1H), 5.58 (d, $J$ = 12.6 Hz, 1H), 4.30 (dd, $J$ = 12.6, 1.5 Hz, 1H), 3.41−2.54 (m, 4H). $^{13}C$ NMR (126 MHz, $CDCl_3$): $\delta$ 176.9, 175.7, 166.0 (d, $J$ = 254.8 Hz), 165.0, 163.5 (d, $J$ = 250.3 Hz), 153.5, 141.1, 136.0, 132.3 (d, $J$ = 9.3 Hz), 131.8, 131.0, 129.5 (d, $J$ = 2.5 Hz), 128.9, 128.8, 128.7, 128.6, 127.7, 127.4, 126.3, 115.8 (d, $J$ = 22.0 Hz), 101.7, 74.4, 69.0, 64.6, 29.7, 28.0. HRMS (ESI-TOF): $m/z$ calcd for $C_{34}H_{25}F_2N_2O_7NaSI$ $[M + Na]^+$ 793.0293, found 793.0278.

*(E)-2-Bromo-2-(2-(2,5-dioxopyrrolidin-1-yl)-2,4-diphenyl-3-tosyloxazolidin-5-ylidene)ethyl Phenyl Carbonate (**2o**).* By following the general procedure (0.20 mmol), the compound was obtained as a white solid: 23.6 mg, 16% yield, mp 171−172 °C. $^1H$ NMR (500 MHz, $CDCl_3$): $\delta$ 8.02−7.89 (m, 2H), 7.78−7.52 (m, 3H), 7.51−7.27 (m, 10H), 6.51 (d, $J$ = 8.0 Hz, 2H), 6.03 (d, $J$ = 1.4 Hz, 1H), 5.86 (d, $J$ = 8.4 Hz, 2H), 5.64 (d, $J$ = 12.7 Hz, 1H), 4.35 (dd, $J$ = 12.7, 1.6 Hz, 1H), 3.02−2.78 (m, 4H), 2.16 (s, 3H). $^{13}C$ NMR (126 MHz, $CDCl_3$): $\delta$ 176.2, 166.0, 152.4, 142.3, 138.4, 135.9, 133.5, 133.3, 130.5, 130.3, 130.1, 129.7, 129.6, 128.63, 128.59, 128.5, 128.2, 126.5, 102.5, 99.6, 67.4, 62.8, 28.4, 21.3. HRMS (ESI-TOF): $m/z$ calcd for $C_{35}H_{29}N_2O_7NaSBr$ $[M + Na]^+$ 723.0777, found 723.0779.

*(E)-2-(2-(4,4-Dimethyl-2,5-dioxoimidazolidin-1-yl)-2,4-diphenyl-3-tosyloxazolidin-5-ylidene)-2-iodoethyl Benzoate (**2q**).* By following the general procedure (0.20 mmol), the compound was obtained as a white solid: 97.9 mg, 62% yield, mp 194−195 °C. $^1H$ NMR (400 MHz, $CDCl_3$): $\delta$ 7.99 (d, $J$ = 7.4 Hz, 2H), 7.75−7.28 (m, 13H), 6.53 (d, $J$ = 8.0 Hz, 2H), 6.00 (s, 1H), 5.89 (s, 2H), 5.64 (s, 1H), 5.38 (d, $J$ = 11.8 Hz, 1H), 4.80 (d, $J$ = 11.9 Hz, 1H), 2.16 (s, 3H), 1.60−1.54 (m, 6H). $^{13}C$ NMR (126 MHz, $CDCl_3$): $\delta$ 176.0, 165.7, 154.7, 154.0, 142.4, 138.4, 136.1, 133.5, 133.2, 131.1, 130.14, 130.06, 129.9, 129.8, 128.7, 128.53, 128.47, 128.2, 126.6, 102.2, 68.9, 64.6, 58.8, 53.5, 29.8, 25.0, 21.3. HRMS (ESI-TOF): $m/z$ calcd for $C_{36}H_{32}N_3O_7NaSI$ $[M + Na]^+$ 800.0903, found 800.0917.

**General Methods for the Synthesis of Iodoalkylidene-dihydrooxazoles 3.** *N*-Sulfonyl propargylamide **1** (0.20 mmol) and the halogen source (1.2 equiv) were dissolved in 2 mL of dry and degassed *N*,*N*′-dimethylformamide. The resulting yellow solution was stirred at room temperature for 12−18 h and quenched with sodium thiosulfate solution. The aqueous layer was extracted with $Et_2O$, and the combined organic layers were washed twice with brine, dried over $MgSO_4$, filtered, and concentrated under reduced pressure. Purification by flash chromatography on silica gel (petroleum ether/EtOAc: 20/1) afforded the expected product.

*(E)-2-(2,4-Diphenyloxazol-5(4H)-ylidene)-2-iodoethyl Benzoate (**3a**).* By following the general procedure (0.20 mmol), the compound was obtained as a white solid: 82.2 mg, 83% yield, mp 111−112 °C. $^1H$ NMR (500 MHz, acetone): $\delta$ 8.14−8.01 (m, 4H), 7.69−7.60 (m, 2H), 7.57−7.50 (m, 4H), 7.46−7.31 (m, 5H), 5.89 (s, 1H), 5.39 (dd, $J$ = 2.6, 1.3 Hz, 2H). $^{13}C$ NMR (126 MHz, acetone): $\delta$ 165.3, 160.8, 158.1, 138.0, 133.3, 132.4, 130.0, 129.4, 128.8, 128.6, 128.5, 128.1, 128.0, 126.2, 76.3, 69.6, 65.7. HRMS (ESI-TOF): $m/z$ calcd for $C_{24}H_{19}INO_3$ $[M + H]^+$ 496.0410, found 496.0409.

*(E)-2-(2-(3-Fluorophenyl)-4-phenyloxazol-5(4H)-ylidene)-2-iodoethyl 3-Fluorobenzoate (**3b**).* By following the general procedure (0.20 mmol), the compound was obtained as a colorless oil: 71.2 mg, 67% yield. $^1H$ NMR (500 MHz, acetone): $\delta$ 7.91 (d, $J$ = 7.8 Hz, 2H), 7.79 (ddd, $J$ = 9.5, 2.6, 1.5 Hz, 1H), 7.74 (ddd, $J$ = 9.5, 2.6, 1.5 Hz, 1H), 7.59 (td, $J$ = 8.1, 5.7 Hz, 2H), 7.49−7.33 (m, 7H), 5.91 (s, 1H), 5.42 (dd, $J$ = 2.5, 1.3 Hz, 2H). $^{13}C$ NMR (126 MHz, acetone): $\delta$ 164.2 (d, $J$ = 2.9 Hz), 162.6 (d, $J$ = 245.4 Hz), 162.5 (d, $J$ = 245.6 Hz), 159.8 (d, $J$ = 3.1 Hz), 158.0, 137.6, 132.3 (d, $J$ = 7.5 Hz), 131.0 (d, $J$ = 8.2 Hz), 130.8 (d, $J$ = 7.9 Hz), 129.1, 128.7, 128.6, 128.5, 128.4, 128.3, 128.1, 125.5 (d, $J$ = 2.8 Hz), 124.2 (d, $J$ = 2.9 Hz), 120.2 (d, $J$ = 21.3 Hz), 119.3 (d, $J$ = 21.4 Hz), 115.9 (d, $J$ = 23.3 Hz), 114.8 (d, $J$ = 24.0 Hz), 76.3, 69.6, 66.1. HRMS (ESI-TOF): $m/z$ calcd for $C_{24}H_{16}F_2NO_3NaI$ $[M + Na]^+$ 554.0041, found 554.0038.

*(E)-2-Iodo-2-(4-phenyl-2-(p-tolyl)oxazol-5(4H)-ylidene)ethyl 4-Methylbenzoate (**3c**).* By following the general procedure (0.20 mmol), the compound was obtained as a light yellow solid: 68.0 mg,


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65% yield, mp 121−122 °C. $^1$H NMR (400 MHz, acetone): $\delta$ 7.95 (dd, $J$ = 8.0, 5.0 Hz, 4H), 7.43−7.28 (m, 9H), 5.85 (s, 1H), 5.36 (s, 2H), 2.41 (s, 6H). $^{13}$C NMR (101 MHz, acetone): $\delta$ 165.3, 160.9, 158.1, 144.0, 142.9, 138.1, 129.5, 129.4, 129.2, 128.6, 128.5, 128.1, 127.9, 123.5, 76.3, 69.6, 65.6, 20.7. HRMS (ESI-TOF): $m/z$ calcd for $C_{26}H_{22}NO_3NaI$ [M + Na]$^+$ 546.0542, found 546.0540.

*(E)-2-Iodo-2-(2-(4-methoxyphenyl)-4-phenyloxazol-5(4H)-ylidene)ethyl 4-Methoxybenzoate (**3d**).* By following the general procedure (0.20 mmol), the compound was obtained as a light yellow solid: 65.6 mg, 59% yield, mp 145−146 °C. $^1$H NMR (500 MHz, acetone): $\delta$ 8.36−7.65 (m, 4H), 7.45−7.29 (m, 5H), 7.15−6.94 (m, 4H), 5.83 (s, 1H), 5.52−5.16 (m, 2H), 3.89 (s, 6H). $^{13}$C NMR (126 MHz, acetone): $\delta$ 164.9, 163.8, 163.0, 160.6, 158.1, 138.3, 131.5, 123.0, 128.6, 128.5, 127.9, 122.2, 118.4, 114.1, 113.8, 76.2, 69.5, 65.4, 55.0. HRMS (ESI-TOF): $m/z$ calcd for $C_{26}H_{22}NO_5NaI$ [M + Na]$^+$ 578.0440, found 578.0449.

*(E)-2-(2-(4-Chlorophenyl)-4-phenyloxazol-5(4H)-ylidene)-2-iodoethyl 4-Chlorobenzoate (**3e**).* By following the general procedure (0.20 mmol), the compound was obtained as a light yellow solid: 63.1 mg, 56% yield, mp 138−139 °C. $^1$H NMR (400 MHz, acetone): $\delta$ 8.06 (dd, $J$ = 8.7, 2.1 Hz, 4H), 7.58 (d, $J$ = 8.6 Hz, 4H), 7.44−7.27 (m, 5H), 5.89 (s, 1H), 5.39 (s, 2H). $^{13}$C NMR (101 MHz, acetone): $\delta$ 164.4, 160.0, 158.0, 139.0, 138.0, 137.7, 131.1, 129.8, 129.0, 129.0, 128.9, 128.6, 128.5, 128.0, 125.0, 76.3, 69.5, 65.9. HRMS (ESI-TOF): $m/z$ calcd for $C_{24}H_{16}Cl_2NO_3NaI$ [M + Na]$^+$ 585.9450, found 585.9441.

*(E)-2-(4-(2-Fluorophenyl)-2-phenyloxazol-5(4H)-ylidene)-2-iodoethyl Benzoate (**3h**).* By following the general procedure (0.20 mmol), the compound was obtained as a colorless oil: 85.3 mg, 83% yield. $^1$H NMR (500 MHz, acetone): $\delta$ 8.10−8.07 (m, 2H), 8.07−8.04 (m, 2H), 7.72−7.61 (m, 2H), 7.60−7.50 (m, 4H), 7.48−7.37 (m, 2H), 7.25−7.14 (m, 2H), 6.10 (s, 1H), 5.39 (m, 2H). $^{13}$C NMR (126 MHz, acetone): $\delta$ 165.3, 161.7, 161.0 (d, $J$ = 247.3 Hz), 157.4, 133.3, 132.4, 130.7 (d, $J$ = 3.2 Hz), 130.4 (d, $J$ = 8.5 Hz), 130.0, 129.4, 128.8, 128.6, 128.15, 126.16, 125.3, 125.2, 124.7 (d, $J$ = 3.4 Hz), 115.5 (d, $J$ = 21.5 Hz), 70.8, 68.7, 65.6. HRMS (ESI-TOF): $m/z$ calcd for $C_{24}H_{17}FNO_3NaI$ [M + Na]$^+$ 536.0135, found 536.0129.

*(E)-2-(4-(3-Fluorophenyl)-2-phenyloxazol-5(4H)-ylidene)-2-iodoethyl Benzoate (**3i**).* By following the general procedure (0.20 mmol), the compound was obtained as a colorless oil: 82.1 mg, 80% yield. $^1$H NMR (400 MHz, acetone): $\delta$ 8.12−8.02 (m, 4H), 7.70−7.60 (m, 2H), 7.54 (t, $J$ = 7.7 Hz, 4H), 7.43 (td, $J$ = 8.0, 6.0 Hz, 1H), 7.28 (d, $J$ = 7.7 Hz, 1H), 7.25−7.18 (m, 1H), 7.11 (td, $J$ = 8.3, 2.2 Hz, 1H), 5.94 (s, 1H), 5.40 (d, $J$ = 1.2 Hz, 2H). $^{13}$C NMR (101 MHz, acetone): $\delta$ 165.1, 162.7 (d, $J$ = 244.5 Hz), 161.1, 157.4, 140.5, 140.4, 133.1, 132.3, 130.3 (d, $J$ = 8.3 Hz), 129.3, 128.6, 128.4, 128.0, 126.0, 124.4 (d, $J$ = 2.9 Hz), 115.2 (d, $J$ = 22.3 Hz), 114.6 (d, $J$ = 21.2 Hz), 75.51, 75.49, 70.0, 65.5. HRMS (ESI-TOF): $m/z$ calcd for $C_{24}H_{17}FNO_3NaI$ [M + Na]$^+$ 536.0135, found 536.0141.

*(E)-2-(4-(4-Bromophenyl)-2-phenyloxazol-5(4H)-ylidene)-2-iodoethyl Benzoate (**3j**).* By following the general procedure (0.20 mmol), the compound was obtained as a light yellow oil: 44.0 mg, 38% yield. $^1$H NMR (500 MHz, acetone): $\delta$ 8.12−8.00 (m, 4H), 7.73−7.62 (m, 2H), 7.61−7.52 (m, 6H), 7.45−7.35 (m, 2H), 5.91 (s, 1H), 5.39 (dd, $J$ = 1.2, 0.8 Hz, 2H). $^{13}$C NMR (126 MHz, acetone): $\delta$ 165.3, 161.2, 157.6, 137.4, 133.3, 132.5, 131.7, 130.6, 130.0, 129.4, 128.8, 128.6, 128.2, 126.1, 121.5, 75.5, 70.0, 65.7. HRMS (ESI-TOF): $m/z$ calcd for $C_{24}H_{18}BrNO_3I$ [M + H]$^+$ 573.9515, found 573.9528.

*(E)-2-Iodo-2-(4-(naphthalen-2-yl)-2-phenyloxazol-5(4H)-ylidene)-ethyl Benzoate (**3k**).* By following the general procedure (0.20 mmol), the compound was obtained as a white solid: 89.4 mg, 82% yield, mp 142−143 °C. $^1$H NMR (400 MHz, acetone): $\delta$ 8.17−8.06 (m, 4H), 8.00 (s, 1H), 7.90 (t, $J$ = 7.5 Hz, 3H), 7.68−7.58 (m, 2H), 7.57−7.37 (m, 7H), 6.07 (s, 1H), 5.43 (s, 2H). $^{13}$C NMR (101 MHz, acetone): $\delta$ 165.2, 160.8, 157.8, 135.0, 133.3, 133.1, 133.0, 132.2, 129.9, 129.3, 128.6, 128.5, 128.4, 128.0, 127.85, 127.82, 127.5, 126.11, 126.10, 125.7, 76.3, 69.7, 65.7. HRMS (ESI-TOF): $m/z$ calcd for $C_{28}H_{20}NO_3NaI$ [M + Na]$^+$ 568.0386, found 568.0393.

*(E)-2-(2-(4-Fluorophenyl)-4-phenyloxazol-5(4H)-ylidene)-2-iodoethyl 4-Fluorobenzoate (**3n**).* By following the general procedure (0.20 mmol), the compound was obtained as a colorless oil: 85.0 mg, 80% yield. $^1$H NMR (400 MHz, acetone): $\delta$ 8.19−8.09 (m, 4H), 7.48−7.21 (m, 9H), 5.88 (s, 1H), 5.39 (t, $J$ = 1.5 Hz, 2H). $^{13}$C NMR (101 MHz, acetone): $\delta$ 165.8 (d, $J$ = 252.1 Hz), 165.2 (d, $J$ = 251.4 Hz), 164.4, 160.0, 158.2, 137.9, 132.35, 132.26, 130.9, 130.8, 128.6, 128.5, 128.0, 126.5 (d, $J$ = 2.9 Hz), 122.8 (d, $J$ = 3.0 Hz), 115.9 (d, $J$ = 22.5 Hz), 115.7 (d, $J$ = 22.4 Hz), 76.3, 69.6, 65.9. HRMS (ESI-TOF): $m/z$ calcd for $C_{24}H_{16}F_2NO_3NaI$ [M + Na]$^+$ 554.0041, found 554.0054.

*(E)-2-Bromo-2-(2,4-diphenyloxazol-5(4H)-ylidene)ethyl Benzoate (**3o**).* By following the general procedure (0.20 mmol), the compound was obtained as colorless oil: 53.3 mg, 60% yield. $^1$H NMR (400 MHz, acetone): $\delta$ 8.19−8.01 (m, 4H), 7.73−7.61 (m, 2H), 7.59−7.51 (m, 4H), 7.47−7.17 (m, 5H), 5.99 (s, 1H), 5.41 (m, 2H). $^{13}$C NMR (101 MHz, acetone): $\delta$ 165.2, 160.7, 156.4, 137.4, 133.1, 132.2, 129.3, 128.6, 128.5, 128.4, 128.03, 128.01, 127.8, 125.9, 96.9, 74.5, 63.6. HRMS (ESI-TOF): $m/z$ calcd for $C_{24}H_{18}BrNO_3Na$ [M + Na]$^+$ 470.0368, found 470.0375.

**Methods for the Synthesis of Iodomethylene-dihydrooxazoles 6.** In a dry Schlenk, propargylamide **5** (1.00 mmol) and NIS (1.2 equiv) were dissolved in 4 mL of freshly distilled dichloromethane. The resulting mixture was stirred at room temperature for 2 h and quenched with sodium thiosulfate solution. The aqueous layer was extracted with $Et_2O$, and the combined organic layers were washed twice with brine, dried over $MgSO_4$, filtered, and concentrated under reduced pressure. Purification by flash chromatography on silica gel (petroleum ether/EtOAc: 20/1) afforded the expected product.

*(E)-5-(Iodomethylene)-2-phenyl-4,5-dihydrooxazole (**6a**).* By following the general procedure (1.00 mmol), the compound was obtained as a white solid: 256.5 mg, 90% yield, known compound.[3b] $^1$H NMR (400 MHz, $CDCl_3$): $\delta$ 8.04−7.86 (m, 2H), 7.53 (t, $J$ = 7.4 Hz, 1H), 7.45 (t, $J$ = 7.5 Hz, 2H), 5.78 (t, $J$ = 3.2 Hz, 1H), 4.63 (d, $J$ = 3.2 Hz, 2H). $^{13}$C NMR (101 MHz, $CDCl_3$): $\delta$ 163.8, 157.8, 131.9, 128.4, 127.8, 126.3, 61.0, 47.0.

*(E)-2-(3-Bromophenyl)-5-(iodomethylene)-4,5-dihydrooxazole (**6b**).* By following the general procedure (1.00 mmol), the compound was obtained as a white solid: 313.1 mg, 86% yield, mp 122−123 °C. $^1$H NMR (400 MHz, $CDCl_3$): $\delta$ 8.02 (s, 1H), 7.80 (d, $J$ = 7.8 Hz, 1H), 7.65−7.47 (m, 1H), 7.23 (t, $J$ = 7.9 Hz, 1H), 5.71 (t, $J$ = 3.1 Hz, 1H), 4.54 (d, $J$ = 3.2 Hz, 2H). $^{13}$C NMR (101 MHz, $CDCl_3$): $\delta$ 162.7, 157.7, 135.1, 131.1, 130.2, 128.6, 126.6, 122.8, 61.3, 47.8. HRMS (ESI-TOF): $m/z$ calcd for $C_{10}H_8BrINO$ [M + H]$^+$ 363.8834, found 363.8842.

**Oxidation of Iodoalkylidenedihydrooxazoles.** Iodoalkylidene-dihydrooxazole **3** or **6** (0.20 mmol) was dissolved in DCE (2 mL), and the resulting mixture was stirred at 80 °C under an $O_2$ atmosphere until the consumption of starting materials detected by TLC. After the reaction was completed, the solvent was evaporated and the organic product purified by column chromatography (petroleum ether/EtOAc: 30/1).

*2-(2,4-Diphenyloxazol-5-yl)-2-oxoethyl Benzoate (**4a**).* By following the general procedure (0.20 mmol), the compound was obtained as a white solid: 53.8 mg, 70% yield, mp 151−152 °C. $^1$H NMR (400 MHz, $CDCl_3$): $\delta$ 8.44−8.31 (m, 2H), 8.22 (d, $J$ = 6.8 Hz, 2H), 8.17 (d, $J$ = 7.4 Hz, 2H), 7.66−7.50 (m, 4H), 7.53−7.38 (m, 5H), 5.58 (s, 2H). $^{13}$C NMR (101 MHz, $CDCl_3$): $\delta$ 181.5, 166.1, 162.3, 148.9, 142.0, 133.6, 132.3, 130.7, 130.2, 129.9, 129.5, 129.4, 129.2, 128.6, 128.5, 127.7, 126.1, 66.9. HRMS (ESI-TOF): $m/z$ calcd for $C_{24}H_{18}NO_4$ [M + H]$^+$ 384.1236, found 384.1242.

*2-oxo-2-(4-Phenyl-2-(p-tolyl)oxazol-5-yl)ethyl 4-Methylbenzoate (**4c**).* By following the general procedure (0.20 mmol), the compound was obtained as a white solid: 65.9 mg, 80% yield, mp 172−173 °C. $^1$H NMR (400 MHz, $CDCl_3$): $\delta$ 8.43−8.32 (m, 2H), 8.11 (d, $J$ = 8.1 Hz, 2H), 8.05 (d, $J$ = 8.1 Hz, 2H), 7.55−7.42 (m, 3H), 7.35 (d, $J$ = 8.0 Hz, 2H), 7.28 (m, 2H), 5.56 (s, 2H), 2.46 (s, 3H), 2.43 (s, 3H). $^{13}$C NMR (126 MHz, $CDCl_3$): $\delta$ 181.6, 166.2, 162.6, 148.9, 144.3, 143.0, 141.9, 130.7, 130.2, 130.1, 130.0, 129.5, 129.3, 128.5, 127.7, 126.8, 123.5, 66.8, 21.9. HRMS (ESI-TOF): $m/z$ calcd for $C_{26}H_{22}NO_4$ [M + H]$^+$ 412.1549, found 412.1539.

*2-(2-(4-Methoxyphenyl)-4-phenyloxazol-5-yl)-2-oxoethyl 4-Methoxybenzoate (**4d**).* By following the general procedure (0.20


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mmol), the compound was obtained as a white solid: 63.9 mg, 72% yield, mp 157−158 °C. $^1$H NMR (500 MHz, $CDCl_3$): $\delta$ 8.43−8.31 (m, 2H), 8.19−8.14 (m, 2H), 8.13−8.06 (m, 2H), 7.57−7.38 (m, 3H), 7.08−7.01 (m, 2H), 6.98−6.90 (m, 2H), 5.52 (s, 2H), 3.90 (s, 3H), 3.87 (s, 3H). $^{13}$C NMR (126 MHz, $CDCl_3$): $\delta$ 181.6, 165.8, 163.9, 163.0, 162.5, 148.9, 141.8, 132.3, 130.6, 130.1, 129.6, 129.5, 128.4, 121.9, 118.8, 114.7, 113.9, 66.7, 55.7, 55.6. HRMS (ESI-TOF): $m/z$ calcd for $C_{26}H_{22}NO_6$ $[M + H]^+$ 444.1447, found 444.1463.

*2-(2-(4-Fluorophenyl)-4-phenyloxazol-5-yl)-2-oxoethyl 4-Fluorobenzoate (**4n**).* By following the general procedure (0.20 mmol), the compound was obtained as a white solid: 60.5 mg, 72% yield, mp 185−186 °C. $^1$H NMR (400 MHz, $CDCl_3$): $\delta$ 8.41−8.29 (m, 2H), 8.23 (dd, $J$ = 8.6, 5.3 Hz, 2H), 8.18 (dd, $J$ = 8.6, 5.6 Hz, 2H), 7.53−7.42 (m, 3H), 7.26−7.21 (m, 2H), 7.15 (t, $J$ = 8.6 Hz, 2H), 5.56 (s, 2H). $^{13}$C NMR (126 MHz, $CDCl_3$): $\delta$ 181.3, 166.3 (d, $J$ = 254.8 Hz), 165.4 (d, $J$ = 254.2 Hz), 165.2, 161.5, 149.0, 142.1, 132.8 (d, $J$ = 9.4 Hz), 130.9, 130.0 (d, $J$ = 8.9 Hz), 129.8, 129.5, 128.5, 125.7 (d, $J$ = 2.9 Hz), 122.5 (d, $J$ = 3.0 Hz), 116.6 (d, $J$ = 22.4 Hz), 115.8 (d, $J$ = 22.1 Hz), 66.9. HRMS (ESI-TOF): $m/z$ calcd for $C_{24}H_{16}F_2NO_4$ $[M + H]^+$ 420.1047, found 420.1058.

*2-Phenyloxazole-5-carbaldehyde (**7a**).* By following the general procedure (0.50 mmol), the compound was obtained as a white solid: 69.6 mg, 80% yield, mp 69−70 °C. $^1$H NMR (400 MHz, $CDCl_3$): $\delta$ 9.82 (s, 1H), 8.18 (d, $J$ = 7.3 Hz, 2H), 7.96 (s, 1H), 7.57−7.47 (m, 3H). $^{13}$C NMR (101 MHz, $CDCl_3$): $\delta$ 176.4, 165.6, 149.7, 139.2, 132.4, 129.2, 127.8, 126.0. HRMS (ESI-TOF): $m/z$ calcd for $C_{10}H_8NO_2$ $[M + H]^+$ 174.0555, found 174.0556.

*2-(3-Bromophenyl)oxazole-5-carbaldehyde (**7b**).* By following the general procedure (0.50 mmol), the compound was obtained as a white solid: 102.9 mg, 82% yield, mp 114−115 °C. $^1$H NMR (400 MHz, $CDCl_3$): $\delta$ 9.84 (s, 1H), 8.33 (t, $J$ = 1.6 Hz, 1H), 8.11 (d, $J$ = 7.8 Hz, 1H), 7.96 (s, 1H), 7.80−7.62 (m, 1H), 7.39 (t, $J$ = 7.9 Hz, 1H). $^{13}$C NMR (101 MHz, $CDCl_3$): $\delta$ 176.4, 163.9, 149.9, 138.9, 135.3, 130.7, 130.6, 127.8, 126.3, 123.3. HRMS (ESI-TOF): $m/z$ calcd for $C_{10}H_7BrNO_2$ $[M + H]^+$ 251.9660, found 251.9658.

**One-Pot and Gram-Scale Synthesis of Oxazoles 4a and 7a.** In a dry Schlenk, *N*-tosyl substrate **1a** (5.0 mmol) and NIS (1.2 equiv) were dissolved in 20 mL of freshly distilled DMF. The resulting mixture was stirred at room temperature for 12 h and then stirred at 80 °C under an $O_2$ atmosphere until the consumption of starting materials detected by TLC. After that, the reaction was quenched with sodium thiosulfate solution. The aqueous layer was extracted with $Et_2O$, and the combined organic layers were washed twice with brine, dried over $MgSO_4$, filtered, and concentrated under reduced pressure. Purification by flash chromatography on silica gel (petroleum ether/EtOAc: 30/1) afforded the expected product **4a** (1.1924 g) in 62% yield.

In a dry Schlenk, propargylamide **5a** (15.0 mmol) and NIS (1.2 equiv) were dissolved in 40 mL of freshly distilled DCE. The resulting mixture was stirred at room temperature for 2 h and then stirred at 80 °C under an $O_2$ atmosphere until the consumption of starting materials detected by TLC. After the reaction was completed, the solvent was evaporated and the organic product purified by column chromatography (petroleum ether/EtOAc: 30/1), giving the expected product **7a** (1.6932 g) in 65% yield.

## ■ ASSOCIATED CONTENT

### Ⓢ Supporting Information

Figures, tables, and a CIF file giving data for the NIS-mediated cyclization of *N*-sulfonyl propargylamides, $^1$H and $^{13}$C NMR spectra of all compounds, and crystallographic data for **2a**. This material is available free of charge via the Internet at http://pubs.acs.org.

## ■ AUTHOR INFORMATION

### Corresponding Author

*E-mail for B.W.: bswan@dicp.ac.cn.

### Notes

The authors declare no competing financial interest.

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