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COMMUNICATION

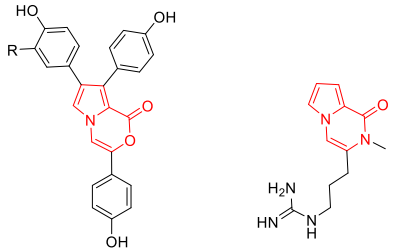
# Zinc chloride mediated synthesis of *3H*-oxazol-2-one and pyrrolo-oxazin-1-one from ynamide

Loïc Habert,[a] Romain Sallio,[a] Muriel Durandetti,[c] Corinne Gosmini,[b] and Isabelle Gillaizeau*[a]

**Abstract:** A simple zinc chloride mediated cyclization of ynamidyl *N*-carbamates or 2-ynamidyl-(hetero)arylcarboxylates is achieved under mild reaction conditions, leading to the synthesis of useful heterocyclic scaffolds, 3*H*-oxazol-2-ones and pyrrolo-oxazin-1-ones, with good yields.

## Introduction

Significant efforts have been devoted toward developing methods and technologies to synthesize original collections of small molecules with useful therapeutic properties. Nowadays, the sustainability of a chemical process is a major aspect that must be considered, and the implementation of green methodologies is of considerable importance. Oxazol-2-one occupies a unique position in the design and synthesis of novel biologically active agents that exhibit significant medicinal activities.[1] However, most of the reported procedures to access these heterocycles have drawbacks, such as the use of expensive catalysts,[2] the need for complex starting materials,[3] and/or drastic conditions.[4] Furthermore, pyrrole-containing heterocycles are widely disseminated within a large number of natural products and biologically active molecules. For instance, pyrrole-fused oxazinone heterocycles are found in marine natural products, such as Lukianol A or B but also in pyrazine analogues like the alkaloid Peramine (Scheme 1).[5] Despite the widespread interest in these structures, the pyrrolo-oxazinone core motif is underused in the literature.[5d] Recently, Balci[6] reported a nucleophilic and electrophilic cyclization of *N*-alkyne-substituted pyrrole derivatives for the construction of similar pyrrolopyrazinone, pyrrolotriazinone and pyrrolo-oxazinone moieties. Previously, the same group[7] achieved access to 3,4-dihydropyrrolo-oxazin-1-one derivatives *via* a gold(III)-catalyzed cyclization reaction from *N*-propargyl-substituted pyrrole. Subsequently, Kerwin[8] described the cyclization of ynpyrroles into pyrrolo[2,1-c]oxazin-1-ones with TBAF in DMF. One should also mention the work of Wei[9] describing the synthesis of pyrido- and pyrrolo[1,2-c][1,3]oxazinon-1-ones through a nucleophilic addition-cyclization process of *N,O*-acetal with ynamides. The pyrrolo[1,2-a]pyrazinone core was also obtained by Kucher[10] during the iodolactonization of methyl 7-allylpyrrolo[2,3-d]pyrimidine-6-carboxylate. In general, intramolecular cycloisomerization reactions that involve an ynamide functionality are achieved either by electrophilic cyclization or by using expensive transition metal catalysts, as previously described by some of us.[11] Oxygen-containing internal nucleophiles have been used in this respect. The literature survey clearly pointed out the lack of simple, cost-effective and ecofriendly protocols for accessing useful frameworks. Given that an acidic environment is necessary for the successful cyclization of ynamidyl *N*-carbamates or 2-ynamidyl-(hetero)arylcarboxylates, we were intrigued to explore the opportunity of using cheap and non-toxic zinc salt to mediate the synthesis. One of our current research interests deals with the functionalization of ynamide to provide key intermediates for the synthesis of small nitrogen-containing scaffolds.[11e,12] Pursuing this objective, we describe herein the zinc chloride mediated synthesis of 5-mono substituted oxazol-2-ones or 3-mono substituted pyrrolo-oxazin-1-ones. The remaining free-alpha-position to the nitrogen atom may afford the possibility of performing further functionalization on this site. It is noteworthy that the formation of ring systems using zinc halides is scarce; only one example of zinc chloride-catalyzed cycloisomerization of alkynes has been reported in the literature to date.[13]




**Scheme 1.** Pyrrolo-oxazin-2-one containing structure and analogue.

## Results and Discussion

As part of our effort to access molecular diversity and original nitrogen-containing scaffolds, we began our investigation from the ynamide **1a**, selected as a model substrate, in order to determine the best reaction conditions for the cyclization step. **1a** was readily prepared by the application of the Hsung copper-catalyzed *N*-alkynylation reaction.[14] Finally, reaction of **1a** with cheap and readily accessible zinc salts led to good yields (Table 1). The

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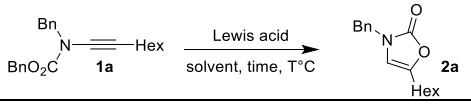
optimized conditions were found to be $ZnCl_2$ (1,2 equiv.) and $CH_2Cl_2$ as a solvent at 40°C for 4h. Accordingly, oxazolone **2a** was obtained in 97% isolated yield *via* a 5-*endo-dig* process. This strategy is a significant achievement in the synthesis of 5-substituted oxazol-2-ones with a free 4-position thanks to its performance, simplicity, and low cost. A series of common solvents were examined revealing that $CH_2Cl_2$ is best suited to the reaction (entries 1-5). The cyclization was also efficiently performed using $ZnBr_2$ (entry 7), however a subsequent reduction in the yield was observed when the amount of Lewis acid was decreased (entry 6). No reaction occurred in the absence of metal salt (entry 8). It is noticeable that a green solvent such as dimethylcarbonate (entry 9) could also be advantageously used. The use of ultrapure and ultra-dry $ZnCl_2$ (entry 10) resulted in a slightly lower yield of **2a**. Different sources of inexpensive metal salts were also tested and good yields were observed using copper (I) bromide but only a 10% yield was obtained when employing copper (II) bromide (entries 11-12).

**Table 1**. Optimization studies.[a]

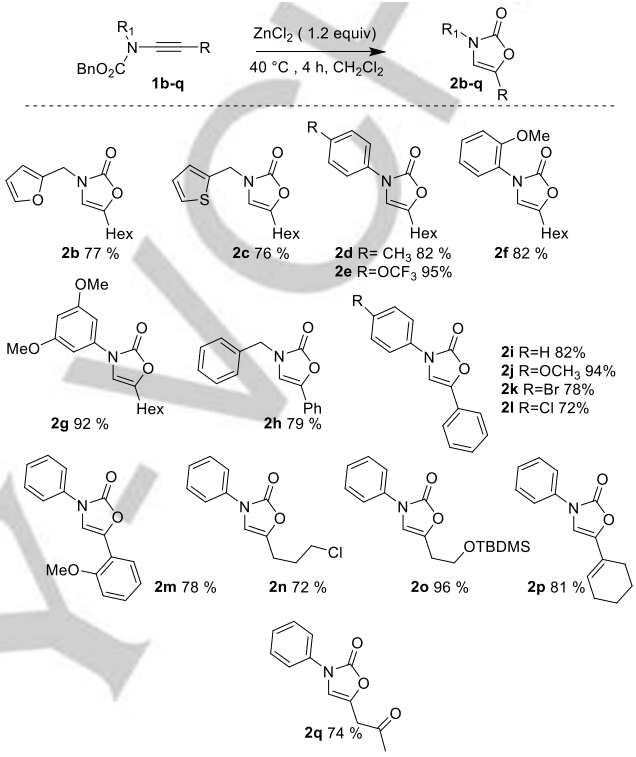



| Entry | Lewis acid | Solvent | Time | T°C | Yields[b] |
|---|---|---|---|---|---|
| 1 | $ZnCl_2$ | $CH_3CN$ | 12 h | 25°C | 79 |
| 2 | $ZnCl_2$ | $CH_3CN$ | 12 h | 50°C | 97 |
| 3 | $ZnCl_2$ | EtOH | 12 h | 50°C | 48 |
| 4 | $ZnCl_2$ | $CH_2Cl_2$ | 12 h | 50°C | 95 |
| 5 | $ZnCl_2$ | $CH_2Cl_2$ | 4 h | 40°C | 97 |
| 6 | $ZnCl_2$[c] | $CH_2Cl_2$ | 4 h | 40°C | 78 |
| 7 | $ZnBr_2$ | $CH_2Cl_2$ | 4 h | 40°C | 94 |
| 8 | - | $CH_2Cl_2$ | 4 h | 40°C | 0 |
| 9 | $ZnCl_2$ | DMC | 4 h | 40°C | 75 |
| 10 | $ZnCl_2$[d] | $CH_2Cl_2$ | 4 h | 40°C | 88 |
| 11 | CuBr | $CH_3CN$ | 12 h | 50°C | 76 |
| 12 | $CuBr_2$ | $CH_3CN$ | 12 h | 50°C | 10 |

[a] General conditions: **1a** (0.2 mmol), Lewis acid (1.2 equiv.), solvent (2 mL). [b] Isolated yields. [c] 0.3 equiv. of $ZnCl_2$ was used. [d] Ultrapure $ZnCl_2$ (99.995% based on trace metals, Sigma-Aldrich) was used. DMC: dimethylcarbonate.

With the optimized reaction conditions in hand, we set about assessing the generality of this protocol and an array of ynamides **1** underwent the desired 3*H*-oxazol-2-ones **2** (Table 2). To extend the scope of the reaction, different ynamides **1b-l** bearing benzyl, heteroarylmethyl or aryl protecting group on nitrogen were indeed easily prepared by Hsung coupling.[14] Then, compounds **1b-l** were successfully subjected to the reaction with $ZnCl_2$ for 4h at 40°C, in a similar manner as **1a**. We then tested the possibility of increasing the level of structural complexity by introducing various chains on the alkyne terminus that could be used for further functionalization (**2m-q**). Synthetically useful functional groups such as alkyl, aryl, halide, alkoxy, alkene, and ketone were well tolerated. Electron-rich hindered aryl groups on the alkyne terminus gave good yields (**2m**). It is noteworthy that the terminal ynamide or the ynamide having a trimethylsilyl (TMS) group on the alkyne part was incompatible with the cyclization reaction; as competing substrate decomposition was observed prior to the complete consumption of the starting material.

**Table 2**. Synthesis of 3*H*-oxazol-2-ones **2b-q** from ynamides **1b-q**.[a,b]

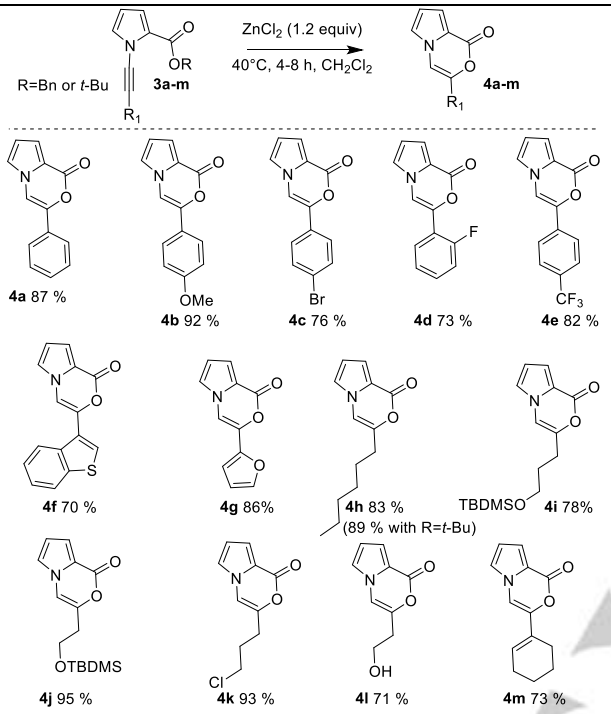



[a] The reactions were performed with **1** (0.2 mmol), $ZnCl_2$ (1.2 equiv.) in $CH_2Cl_2$ (2 ml) at 40°C for 4h. [b] Isolated yields.

To further explore the utility of this simple procedure, upon modification of the core of the carboxylate moiety, ynpyrrole carboxylate **3a-m** gave satisfactory results leading to a range of original 1*H*-pyrrolo[2,1-c][1,4]oxazin-1-one derivatives **4a-m** having a free 2-position (Table 3). The reaction proceeded smoothly in the sole presence of $ZnCl_2$ and with a range of readily available ynpyrroles. We noticed in this case a slight increase in the reaction time. No trace of pyrrolo[2,1-b]oxazole derivative resulting from a 5-*exo-dig* cyclization was observed. Various substituents borne by the ynamide were compatible. The presence of an aryl group bearing either electron-donating (**4b**) or –withdrawing groups (**4c-e**) gave satisfactory results. Hence, given the prevalence of heterocycles in medicinal chemistry, we were pleased to observe that electron-rich heterocycles such as benzothiophene (**4f**) or furan (**4g**) are allowed, giving the corresponding cyclization product in excellent yield. Moreover, when the alkyne terminus bears an aryl group, a linear substitution or a cyclic alkenyl group, 6-endo-dig cyclization products were isolated in good yields. This mild method works well with long alkyl chain (**4h**), a terminal OTBDMS (**4i-j**), a halide (**4k**), or with unprotected hydroxyl (**4l**) group. **4h** was also successfully synthesized starting from the corresponding *tert*-butyl ester (R=*t*-Bu). It is worth noting that the chloro compound **4k** is the synthetic precursor of peramine (Scheme 1), a food deterrent for insects.[15] This strategy should prove highly useful

for the synthesis of 3-substituted pyrrolo[2,1-c][1,4]oxazin-1-one derivatives with a free 2-position because of the ease of implementation, the smooth conditions and the good yields observed.

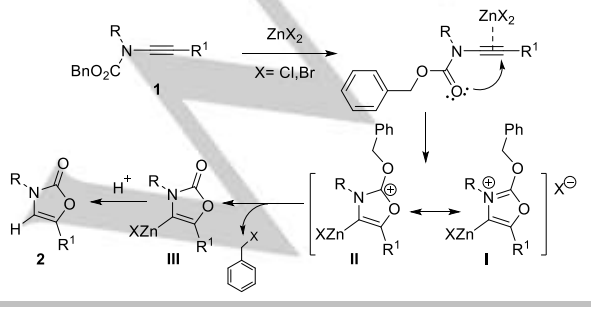
**Table 3**. Synthesis of 1*H*-pyrrolo[2,1-c][1,4]oxazin-1-one derivatives **4a-m** from ynamides **3a-m**.[a,b]




[a] The reactions were performed with **3** (0.2 mmol), $ZnCl_2$ (1.2 equiv.) in $CH_2Cl_2$ (2 ml) at 40°C for 4-8h. [b] Isolated yields.

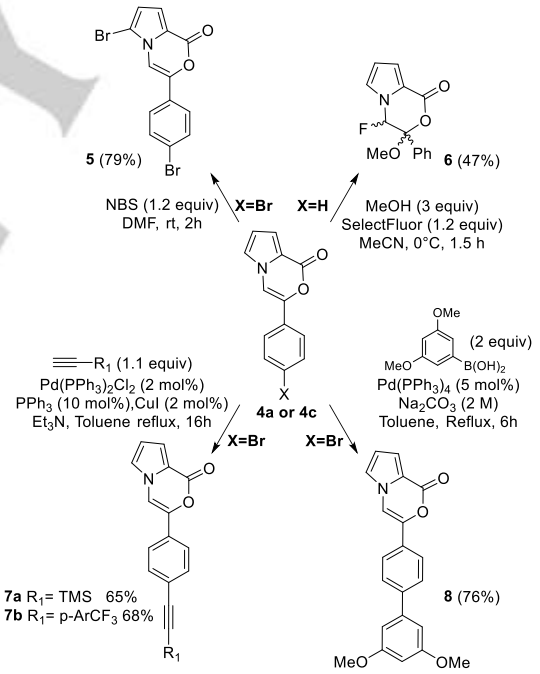
Based on the literature precedence, a plausible mechanism is proposed here for the zinc-mediated cyclization of ynamide to oxazolone, and is outlined in Scheme 2. First, an interaction of zinc chloride with the alkyne moiety of **1** promotes a regioselective 5-*endo-dig* intramolecular nucleophilic attack of carbonyl oxygen. The generating intermediate **I** forms a resonance-stabilized cation intermediate **II** that loses benzyl halide, evidenced by 1H NMR of the crude mixture, to give the vinylzinc intermediate **III**. Finally, the vinylzinc intermediate **III** is then spontaneously quenched *in situ* leading to the observed oxazolone derivative **2**. A similar approach is envisaged from **3** via a regioselective 6-*endo-dig* process leading to the 1H-pyrrolo[2,1-c][1,4]oxazin-1-one **4**.

**Scheme 2.** Plausible mechanism.




Further, to demonstrate the usefulness of this strategy, the pyrrolo-oxazinones **4a** and **4c** were diversified (scheme 3). We sought first to explore the reactivity of **4** in a halogenation reaction. A chemoselective bromination was carried out from **4c** in the presence of NBS, leading with good yields to the α-bromo pyrrole derivative **5**[16] whereas in the presence of Selectfluor, the oxyfluorination of the oxazinone ring of **4a** took place, giving the selective formation of the α-fluoroacetal **6**. Compound **6** was isolated as a single diastereoisomer (d.r.>98:2); however, the diastereoselectivity of this oxyfluorination reaction could not be determined.[17] More importantly, the reaction proceeded with a complete regioselectivity[18] with the introduction of the fluorine alpha to the nitrogen atom which is opposite to that observed with enamides.[19] This switch in regioselectivity might be attributed to the presence of a phenyl substituent at the C-3 position of the oxazinone intermediate that may favor the building of a transient positive charge. In addition, to include diverse functionalities, Sonogashira and Suzuki-Miyaura cross-coupling reactions were applied to **4c** leading respectively to **7a-b** or **8** with good yields. These kinds of scaffolds are found in many natural products and/or pharmacologically relevant therapeutic agents.

**Scheme 3.** Functionalization of the pyrrolo-oxazin-1-one **4a** or **4c**.




## Conclusions

In summary, we have developed an original and simple zinc-chloride mediated synthesis of 3*H*-oxazol-2-ones and 1*H*-pyrrolo[2,1-c][1,4]oxazin-1-ones from ynamides, which exhibited good substrate scope and functional group compatibility. A variety of derivatives was obtained under mild reaction conditions and using a cheap, abundant and low-toxic metal such as zinc salts which provide a good handle for further elaboration. This result

showcases the potential application of this method to the late stage diversification of pharmaceutically active compounds.

## Experimental Section

**General Information.** All reagents and solvents were purchased from commercial sources and used as received. All manipulations were conducted under argon. The reactions were monitored by thin-layer chromatography (TLC) using silica gel (60 F254) plates. Compounds were visualized using a UV lamp (254 nm) and/or by potassium permanganate stain. Flash column chromatography was carried out 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 a Thermo Scientific Nicolet iS10. $^{1}H$, $^{13}C$ and $^{19}F$ NMR spectra were recorded on a spectrometer at 250 MHz ($^{13}C$, 62.9 MHz) or 400 MHz ($^{13}C$, 100 MHz; $^{19}F$: 376 MHz CPD). Chemical shifts are given in parts per million from tetramethylsilane (TMS) as internal standard. The following abbreviations are used for the proton spectra multiplicities: s: singlet, d: doublet, t: triplet, q: quartet, qt: quintuplet, m: multiplet, br.: broad, dd: double doublet, dt: double triplet. High-resolution accurate mass measurements (HRAM) were recorded with a Maxis Bruker 4G instrument and were performed in positive mode with an ESI source on a Q-TOF mass spectrometer with an accuracy tolerance of 2 ppm by the "Fédération de Recherche" ICOA/CBM (FR2708) platform.

**General procedure GP1 : Synthesis of ynamides (1b-1q)**. In a reaction vial flushed with argon and equipped with a stirring bar, were added bromoalkyne (1.1 equiv.), the protected secondary amine (1.0 equiv.), $CuSO_4$•$5H_2O$ (10 mol%), 1,10-phenantroline (20 mol%), $K_3PO_4$ (2.0 equiv.) and toluene (0.33 M). The reaction mixture was capped and heated at 80 °C until completion (TLC monitoring). The mixture was then allowed to cool down to room temperature and concentrated. The crude compounds were purified by silica gel flash-column chromatography with a petroleum ether/AcOEt elution system. Ynamides **1a**,[12a] **1h**,[19],**1i**[2c] were synthesized according to reported literature procedures.

**General Procedure GP2: Synthesis of 2b-2q and 4a-4m**. To a mixture of ynamide **1** or **3** (see GP3) (0.2 mmol) in $CH_2Cl_2$ (2 mL) in a reaction vial was added $ZnCl_2$ (1.2 equiv.). The reaction mixture was capped and heated in an oil bath at 40°C for 2-8 h while being monitored by TLC analysis. Upon completion, the reaction mixture was cooled to rt. The crude products were purified by silica gel flash column chromatography with a petroleum ether/AcOEt elution system. Oxazolones **2a**,[11] **2h**,[2] **2i**[14] were synthesized according to the literature procedures.

**General Procedure GP3: Synthesis of ynamides (3a-3m).** To a mixture of pyrrole-2-carboxylate (1.0 equiv.), $K_3PO_4$ (2.0 equiv.), $CuSO_4.5H_2O$ (0.10 equiv.), and 1,10-phenanthroline (0.20 equiv.) in a reaction vial was added a solution of 1- bromoalkyne (1.3 equiv., 1.0 M) in toluene. The reaction mixture was capped and heated in an oil bath at 80°C for 48 h while being monitored by TLC analysis. Upon completion, the reaction mixture was cooled to room temperature, diluted with EtOAc, filtered through Celite™, and the filtrate was concentrated in vacuo. The crude products were purified by silica gel flash column chromatography with a petroleum ether/AcOEt elution system.

**6-bromo-3-(4(bromophenyl)pyrrolo[2,1-c][1,4]oxazin-1-one (5)**. To a solution of 3-(4-bromophenyl)pyrrolo[2,1-c][1,4]oxazin-1-one **4c** (72 mg, 0.25 mmol, 1 equiv.) in DMF (2 mL) was added NBS (48 mg, 0.27 mmol, 1.1 equiv) at 25°C. After 2h, the reaction mixture was quenched with water (2 mL). The organic phase was extracted with EtOAc (3x10 mL), dried over $MgSO_4$ and concentrated under reduced pressure. The product was purified by flash chromatography on silica gel with petroleum ether/ethyl acetate (80/20) as eluent to give compound **5** as a white gum (72 mg, 79 %). $^{1}H$ NMR (400 MHz, $CDCl_3$): δ 7.63-6.56 (m, 4H), 7.52 (s, 1H), 7.28 (d, *J* = 4.2 Hz, 1H), 6.63 (d, *J* = 4.2 Hz, 1H). $^{13}C$ NMR (100 MHz, $CDCl_3$): $^{13}C$ NMR (100 MHz, $CDCl_3$): δ 153.5, 142.0, 132.1, 129.2, 126.0, 123.9, 117.7, 116.6, 116.2, 104.2, 102.3. HRMS ($ESI^+$): calcd for $C_{13}H_8NBr_2O_2$ [M+H]+ : 389.8735, found 389.8735.

**4-fluoro-3-methoxy-3-phenyl-3,4-dihydro-1H-pyrrolo[5,1-c][1,4]oxazin-1-one (6).** To a solution of 3-phenylpyrrolo[2,1-c][1,4]oxazin-1-one **4a** (42.2 mg, 0.2 mmol) and Selectfluor® (70.4 mg, 0.2 mmol) in $CH_3CN$ (2 mL) at 0 °C was added $CH_3OH$ (24 µL, 0.59 mmol). The reaction was then stirred at the same temperature for 1.5 h. The reaction was quenched with $H_2O$, and the organic phase was extracted with EtOAc. The combined extracts were washed with brine, dried over $MgSO_4$ and concentrated under reduced pressure. The product was purified by flash chromatography on silica gel with petroleum ether/ethyl acetate (9/1) as eluent to give **6** as a white gum (24 mg, 47 %). $^{1}H$ NMR (400 MHz, $CDCl_3$): δ 7.72-7.68 (m, 3H), 7.57-7.48 (m, 2H), 7.30 (dd, *J* = 3.7, 1.7 Hz, 1H), 7.15 (dd, *J* = 2.8, 1.5 Hz, 1H), 6.48 (dd, *J* = 3.9, 2.8 Hz, 1H), 6.02 (d, *J* = 54.8 Hz, 1H), 3.25 (s, 3H). $^{13}C$ NMR (100 MHz, $CDCl_3$): $^{13}C$ NMR (100 MHz, $CDCl_3$): δ 155.8, 133.0, 130.0, 128.9, 127.0, 126.0, 119.8, 117.8, 112.7, 103.8, 90.2 (*J* = 210 Hz), 51.2. $^{19}F$ NMR (376 MHz, $CDCl_3$): δ -135.4 (*J* = 54.8 Hz). HRMS (ESI+): calcd for $C_{14}H_{13}NFO_3$ [M+H]+ : 262.0873 found 262.0872.

**General Procedure GP4: Synthesis of 7a-7b via a Sonogashira coupling**. To a mixture of the arylbromide **4c** (0.30 mmol, 1 equiv) and alkyne (0.33 mmol, 1.1 equiv) in toluene (1.0 mL) were added $PPh_3$ (0.03 mmol, 0.1 equiv), $Et_3N$ (60 µl), and CuI (0.015 mmol, 5 mol%). The reaction mixture was degassed under argon, $PdCl_2(PPh_3)_2$ (4 mg, 0.006 mmol, 2 mol%) was added and was heated at reflux for 18 h. After cooling down to room temperature, water (25 mL) was added. The reaction mixture was extracted with ethyl acetate (3 x 30 mL). The organic extracts were combined, washed with water (2 x 25 mL) and brine (50 mL), and dried over $MgSO_4$. The solvent was evaporated under reduced pressure and the residue was purified by silica gel flash column chromatography with a petroleum ether/AcOEt elution system.

**3-[4-(2-trimethylsilylethynyl)phenyl]pyrrolo[2,1-c][1,4]oxazin-1-one (7a):** Flash-column chromatography on silica gel with petroleum ether/ethyl acetate (90:10) as eluent gave **7a** as a colourless oil (51 mg, 65 %) according to **GP4**. $^{1}H$ NMR (400 MHz, CDCl3): δ 7.69-7.66 (m, 2H), 7.56-7.54 (m, 2H), 7.50 (s, 1H), 7.32-7.30 (m, 1H), 7.21-7.19 (m, 1H), 6.63-6.62 (m, 1H), 0.29 (s, 9H). $^{13}C$ NMR (100 MHz, $CDCl_3$): δ 154.5, 141.5, 132.4, 130.3, 125.8, 123.9, 121.5, 116.8, 116.0, 113.8, 104.9, 104.3, 96.4, -0.10. HRMS ($ESI^+$): calcd for $C_{18}H_{18}NO_2Si$ $[M+H]^+$ : 308.1101 found 308.1105.

**3-[4-[2-[4-(trifluoromethyl)phenyl]ethynyl]phenyl]pyrrolo[2,1-c][1,4]oxazin-1-one (7b):** Flash-column chromatography on

silica gel with petroleum ether/ethyl acetate (90:10) as eluent gave **7b** as a colourless oil (67 mg, 68 %) according to **GP4**. $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.76-7.74 (m, 2H), 7.68-7.62 (m, 6H), 7.54 (s, 1H), 7.33-7.32 (m, 1H), 7.23-7.22 (m, 1H), 6.65-6.63 (m, 1H). $^{13}$C NMR (100 MHz, $CDCl_3$): δ 154.5, 141.4, 132.2, 131.8, 130.6, 125.4, 124.1, 123.5, 121.6, 116.8, 116.1, 113.9, 105.0, 91.10, 89.7. $^{19}$F NMR (376 MHz , $CDCl_3$): δ -62.8. HRMS ($ESI^+$): calcd for $C_{22}H_{13}NO_2F_3$ $[M+H]^+$ : 380.0892 found 380.0897.

**3-[4-(3,5-dimethoxyphenyl)phenyl]pyrrolo[2,1-c][1,4]oxazin-1-one (8):** To a mixture of the 3-(4-bromophenyl)pyrrolo[2,1-c][1,4]oxazin-1-one **4c** (0.20 mmol, 1 equiv) and the arylboronic acid (0.40 mmol, 2 equiv) in toluene (1.0 mL) was added a solution of aqueous $Na_2CO_3$ (0.30 mL, 2M). The reaction mixture was degassed under argon, $Pd(PPh_3)_4$ (0.01 mmol, 5 mol %) was added and it was heated at reflux for 6 h. After cooling down to room temperature, water (25 mL) was added. The reaction mixture was extracted with ethyl acetate (3 x 30 mL). The organic extracts were combined and washed with water (2 x 25 mL) and brine (50 mL), and dried over $MgSO_4$. The solvent was evaporated under reduced pressure. Flash-column chromatography on silica gel with petroleum ether/ethyl acetate (90:10) as eluent gave **8** as a colourless oil (68 mg, 76 %). $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.79-7.76 (m, 2H), 7.66-7.62 (m, 2H), 7.50 (s, 1H), 7.30 -7.29 (m, 1H), 7.21-7.19 (m, 1H), 6.76-6.74 (m, 2H), 6.61-6.59 (m, 1H), 6.50-6.48 (m, 1H), 3.86 (s, 6H). $^{13}$C NMR (100 MHz, $CDCl_3$): δ 161.2, 154.7, 142.2, 142.1, 142.0, 129.6, 127.6, 124.6, 121.5, 116.9, 115.8, 113.7, 105.4, 104.3, 99.7, 55.5. HRMS ($ESI^+$): calcd for $C_{21}H_{18}NO_4$ $[M+H]^+$ : 348.1230 found 348.1233.

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**Keywords:** ynamide • oxazolone • pyrrolo-oxazinone • zinc chloride • cyclization

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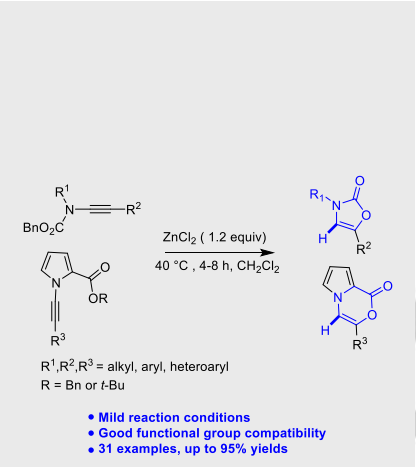
## COMMUNICATION

A simple zinc chloride mediated cyclization of ynamidyl N-carbamates or 2-ynamidyl-(hetero)arylcarboxylates is smoothly achieved, leading to the synthesis of useful heterocyclic scaffolds, 3H-oxazol-2-ones and pyrrolo-oxazin-1-ones, with good yields.




**Oxazol-2-one and pyrrolo-oxazin-1-one**

*Loïc Habert, Romain Sallio, Muriel Durandetti Corinne Gosmini, and Isabelle Gillaizeau**

***Page No. – Page No.***

**Zinc chloride mediated synthesis of *3H*-oxazol-2-one and pyrrolo-oxazin-1-one from ynamide**