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FULL PAPER

A facile synthesis of 3-(arylthio)imidazo[1,2-*a*]pyridin-2(3H)-ones from 2-aminopyridinium bromides and sodium arenesulfinates

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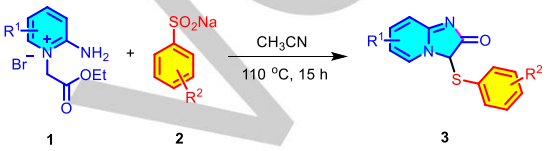
Supporting information (Copy of ^{1}H & ^{13}C NMR spectra of **3** and crystallographic data of **3aa**) for this article is given via a link at the end of the document.

Abstract: A simple and convenient method has been developed for the synthesis of 3-(arylthio)imidazo[1,2-*a*]pyridin-2(3H)-ones via a catalyst-free reaction of 2-aminopyridinium bromides with sodium arenesulfinates. A variety of 3-(arylthio)imidazo[1,2-*a*]pyridin-2(3H)-ones were obtained in moderate to excellent (33-85%) yields. The developed protocol is operationally simple, exhibits a broad substrate scope with a wide range of functional groups, and is amenable for gram-scale synthesis.

Introduction

Imidazo[1,2-*a*]pyridine is an important skeleton that has been found to be present in many natural products, marketed drugs, molecules with a diverse range of biological activities and organometallics.[1] Due to their widespread applications in materials and medicinal chemistry, considerable efforts have been devoted toward the synthesis and functionalization of imidazoheterocycles during the past decades.[2] Among them, the development of efficient synthetic methods for sulfenylation has attracted increasing attention of chemists due to considerable therapeutic value of sulfenylated heteroarenes against a variety of diseases.[3] Several reagents such as thiols,[4] disulfides,[5] sulfonyl hydrazides,[6] thiosulfate salts,[7] sulfonyl halides,[8] sulfinates,[9] sulfinic acid,[10] dithiocarbamates,[11] sulfenyl chloride,[12] S-phenyl benzenesulfonothioate,[13] sodium sulfide,[14] thiocyanate,[15] DABSO [DABCO·$(SO_2)_2$][16] and elemental sulfur[17] have been utilized for sulfenylation of Imidazo-heterocycles under transition metal catalyzed and metal-free conditions.[18] Among different sulfur sources, sodium benzenesulfinate is a stable and odorless sulfur source.[19] Most of these methods developed for the synthesis of 3-sulfenyl-imidazo[1,2-*a*]pyridines utilize pre-synthesized imidazo[1,2-*a*]pyridine moiety. There are only a few methods available in which construction of imidazo[1,2-*a*]pyridine skeleton and sulfenylation take place in one-pot.[20] Thus, the development of new methods for the synthesis of 3-sulfenyl-imidazo[1,2-*a*]pyridine derivatives under one-pot reaction conditions is highly desirable. As part of our ongoing interest to explore the applications of 2-aminopyridinium salt in organic synthesis,[21] herein, we report a convenient method for the synthesis of 3-(arylthio)imidazo[1,2-*a*]pyridin-2(3H)-ones (**3**) from 2-amino-pyridinium bromides (**1**) and sodium arenesulfinates (**2**) under catalyst- and base-free conditions (Scheme 1).

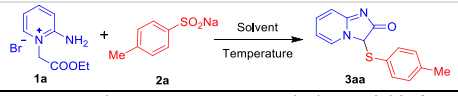


Scheme 1. Synthesis of 3-(arylthio)imidazo[1,2-*a*]pyridin-2(3H)-ones.

Results and Discussion

Our study begin by choosing 2-amino-1-(2-ethoxy-2-oxoethyl)-pyridin-1-ium bromide (**1a**) and sodium *p*-toluenesulfinate (**2a**) as the model substrates for optimizing the reaction conditions. Initial reaction of **1a** and **2a** in CH_3CN solvent at 110 °C for 15 h produced 3-(*p*-tolylthio)imidazo[1,2-*a*]pyridin-2(3*H*)-one (**3aa**) in 40% yield (Table 1, entry 1). Structure of **3aa** was elucidated with the help of IR, NMR and mass data. A peak at 1643 cm^{-1} ($C{=}O_{str}$) in the IR spectrum and at 161.1 ppm in the ^{13}C NMR spectrum of **3aa** confirmed the presence of amidic C=O group.

Table 1. Optimization of reaction conditions.[a]



S. No.	Solvent	Temp. (°C)	Yield of **3aa** (%)[b]
1.	CH_3CN	110	40
2.	DCE	110	30
3.	DCM	110	15
4.	Acetone	110	38
5.	DMF	110	25
6.	H_2O	110	20
7.	Dioxane	110	23
8.	Toluene	110	15
9.	CH_3CN	110	55[c]
10.	CH_3CN	110	82[d]
11.	CH_3CN	110	78[e]
12.	CH_3CN	90	70[d]
13.	CH_3CN	60	56[d]
14.	CH_3CN	130	75

[a]Reaction conditions: **1a** (1.0 mmol), **2a** (1.0 mmol), solvent (3 mL), 15 h. [b]Isolated yield. [c]1.5 mmol of **2a** was used, [d]2.0 mmol of **2a** was used, [e]2.5 mmol of **2a** was used.

Encouraged with initial result, we examined the reaction conditions by varying different solvents, amount of **2a**, and

reaction temperature (Table 1, entries 2-14). Among all screened solvents, acetonitrile was found to be the most suitable solvent for this reaction. Pronounced effect on the reaction yield was observed by increasing the amount of **2a**. The yield of **3aa** increased from 40 to 82% on increasing the amount of **2a** from one equivalent to two equivalent (Table 1, entries 9-10). Further increasing the amount of **2a** did not increase the yield of desired product, but led to slightly lower yields (Table 1, entry 11). Performing the reaction at temperatures less than 110 °C resulted in lower yields of **3aa** (Table 1, entries 12-13). On the other hand, increasing the temperature to 130 °C did not improve the yield of **3aa** either (Table 1, entry 14).

To evaluate the general applicability of the developed protocol, reaction of various 2-aminopyridinium bromides (**1a-m**) with sodium arenesulfinates (**2a-k**) were performed under optimized reaction conditions (Table 2). It was found that the arenesulfinates possessing electron-donating groups on the aryl ring furnished desired products in higher yields compared to those with electron-withdrawing groups (**3aa-3ae** *vs* **3ag-3aj**). Notably, halo groups such as fluoro, chloro and bromo on the aryl ring of sulfinates were well tolerated and provided corresponding products **3ah-3aj** in modest (44-50%) yields. *Ortho*-substituted arenesulfinates **1c** and **1k** also reacted smoothly to afford **3ac** and **3ak** in 71% and 55% yields, respectively. Disappointingly, reaction of **1a** with sodium methanesulfinate did not produce corresponding 3-(methylthio)imidazo[1,2-*a*]pyridin-2(3H)-one under these conditions.

Next, substrate scope of 2-aminopyridinium bromides was examined. 2-Aminopyridinium bromides substituted with groups such as methyl, chloro, bromo, iodo, amino, aryl and heteroaryl on the pyridine ring (**1b-m**) reacted with **2b** to afford the corresponding products **3bb-3mb** in moderate to good (40-85%) yields. Interestingly, substrate **1f** with C5-bromo and C3-amino groups on 2-aminopyridine ring furnished corresponding product **3fd** in 85% yield. The reaction of **1d-m** with other sodium sulfinates (**2a**, **2f**, **2i** and **2k**) also went smoothly to produce **3da-3mk** in moderate to good yields. Comparing the yield of **3ed** and **3fd**, we concluded that the presence of the electron-donating group at C3 position of 2-aminopyridinium bromide increases the rate of the reaction.

The IR, NMR and HRMS data of all the synthesized compounds were in good agreement with the proposed structure. In the ^{1}H NMR spectra, C3-proton was not visible as it takes position on the five member ring nitrogen to give zwitter ionic form and molecule forms hydrogen bonded dimer. The structure of **3ab** was unambiguously confirmed by single-crystal X-ray analysis (Figure 1, CCDC No. 2012504). The compound crystallized in the monoclinic P2$_1$/c space group and obtained in the zwitterion form. Intermolecular hydrogen bonding dimeric structure is observed with N2-H…O1 non-covalent bond length 1.838 Å (Supp. Info, Figure S1).

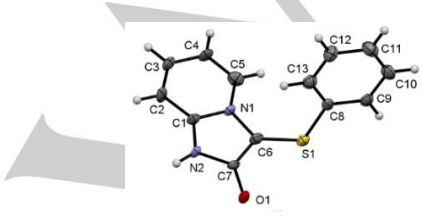
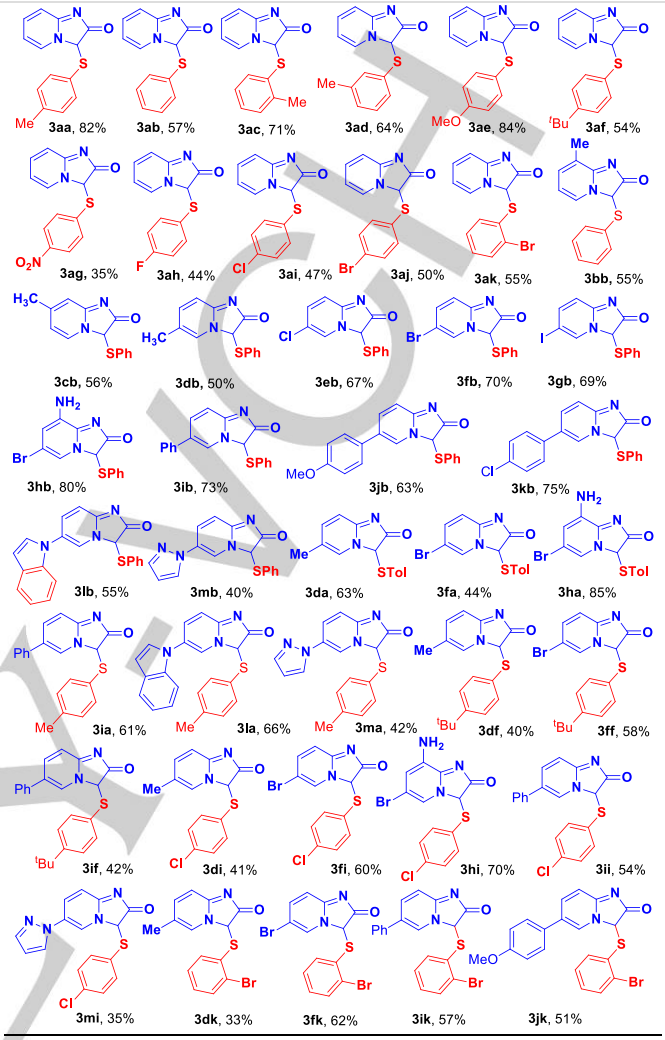


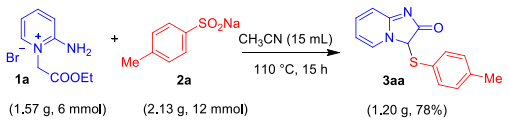
Figure 1. ORTEP diagram of the compound **3ab** (CCDC No. 2012504). Thermal ellipsoids were drawn at the 50% probability level.

Table 2. Substrate scope for sodium arenesulfinates and 2-aminopyridinium bromides.[a,b]



[a]Reaction conditions: **1** (1.0 mmol), **2** (2.0 mmol), CH_3CN (3 mL), 110 ºC, 15 h. [b]Isolated yield.

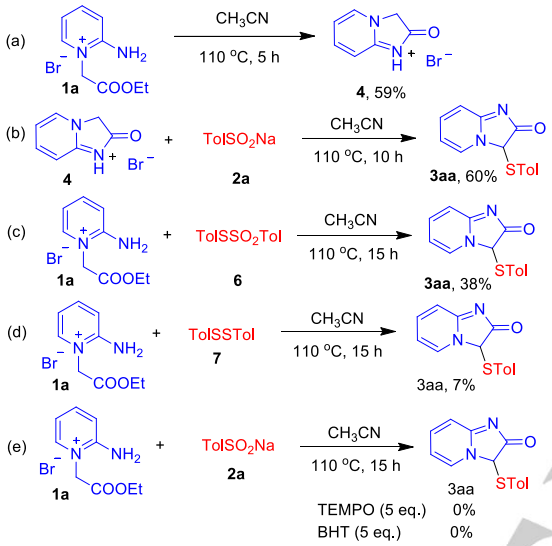
The practical applicability of the developed methodology was demonstrated by performing the reaction of **1a** with **2a** on a 6 mmol scale. The desired product **3aa** was obtained in 1.20 g (78%) yield under the optimized reaction conditions (Scheme 2).



Scheme 2. Gram scale synthesis of **3aa**.

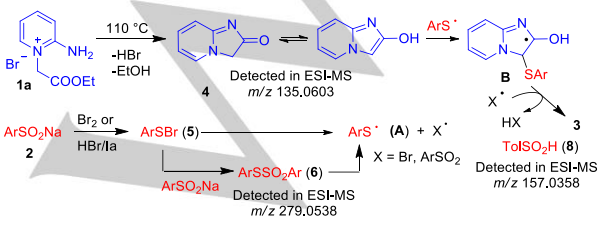
To understand the mechanism of the reaction, a series of control experiments were executed (Scheme 3). Initially, when **2a** was heated at 110 ºC in acetonitrile for 5h, cyclized product, imidazo[1,2-*a*]pyridin-2(3H)-one (**4**) was obtained in 59% yield (Scheme 3a). The reaction of **4** with **2a** afforded **3aa** in 60% yield (Scheme 3b). On the other hand, a reaction of **1a** with *S*-aryl arenethiosulfonate (**6**) and *p*-tolyl disulfide (**7**) produced **3aa** in 38% and 7% yields, respectively under standard conditions

(Scheme 3c & 3d). These results indicated that **6** could be the possible intermediates in this reaction. Further, the peaks at *m/z* 135.0603, 157.0358 and 279.0538 in the LC-HRMS (ESI) analysis of the reaction mixture of **1a** and **2a** indicated the formation of **4**, *p*-toluenesulfinic acid (**8**) and **6** as intermediates. The reaction of **1a** and **2a** was completely inhibited when performed in the presence of TEMPO and BHT (Scheme 3e). These results suggest the involvement of a free radical pathway in this reaction. It is worth mentioning that on heating **2a** under standard conditions in the absence of **1a**, the formation of **6** or **7** was not observed. Thus, HBr generated during the cyclization of **1a** has an essential role for the reactivity of **2a**.



Scheme 3. Control experiments.

Based on the control experiments and literature reports,[22] a plausible reaction mechanism for the formation of **3** is depicted in scheme 4. Initially on heating **1a** undergoes intramolecular amidation to produce **4**. The reaction of sodium sulfinate with *in situ* generated Br_2 or HBr/**1a** leads to the formation of arenesulfenyl bromide (**5**). The reaction of **5** with **2** produces *S*-aryl arenethiosulfonate (**6**), which was detected in LC-MS of the reaction mixture. Homolytic cleavage of **5** or **6** under thermal conditions yields sulfenyl radical **A**.[23] Finally, addition of sulfenyl radical (**A**) to the enol form of **4** generates radical intermediate **B**, which on proton abstraction leads to the formation of 3-sulfenylimidazo[1,2-*a*]pyridin-2-(3*H*)-ones (**3**). Possibility of electrophilic substitution of **4** by **5** or **6** cannot be ruled out, although the radical-trapping experiments supports the radical mechanism.



Scheme 4. Proposed mechanism for the formation of **3**.

Conclusion

In summary, a convenient catalyst-, metal-, and base-free method has been developed for the preparation of 3-sulfenylimidazo[1,2-*a*]pyridin-2-(3*H*)-ones from 2-aminopyridinium bromides and sodium arenesulfinates under mild conditions. The method allowed direct synthesis of 3-sulfenylimidazo[1,2-*a*]pyridin-2-(3*H*)-ones in good to excellent yields with excellent functional group tolerance. The reaction is supposed to proceed though radical pathway. We believe that the developed method is significant, owing to its potentially simple operational procedure and amenability for gram-scale synthesis.

Experimental Section

General information: The thin-layer chromatography (TLC) was performed on 0.25 mm silica gel 60-F254, and visualized under a UV lamp. Column chromatography was performed using silica gel (100−200 mesh) using hexane/ethyl acetate as eluents. Melting points were measured using an automatic capillary point apparatus and are uncorrected. The IR spectra were recorded on an FT-IR instrument, and values are expressed in cm^{-1}. The ^1H and ^{13}C NMR spectra were obtained on a 400 MHz and 100 MHz spectrometer. Coupling constants and chemical shifts were reported in hertz (Hz) and parts per million (ppm), respectively, relative to the internal standard of tetramethylsilane (TMS). The HRMS were analyzed by the electrospray ionization (ESI) method in positive mode on a Q-TOF LC-MS spectrometer. Sodium sulfinates (**2a, 2d, 2e, 2i** and **2j**) were purchased from Alfa Aesar and used as received without further purification. Other sodium sulfinates (**2b, 2c, 2f-2h** and **2k**) were prepared by heating appropriate sulfonyl chlorides with a mixture of sodium sulfite and sodium bicarbonate in the water at 80 ºC.[24] All other chemicals and solvents were purchased from commercial sources and used without further purification.

Procedure for synthesis of 3-sulfenylimidazo[1,2-*a*]pyridin-2-(3*H*)-ones (3).

An oven-dried round bottom flask (10 mL) was charged with 2-aminopyridinium bromide (**1,** 1 mmol) and sodium sulfinate (**2**, 2 mmol) in CH_3CN (3 mL) solvent. The resulting reaction mixture was heated to 110 °C with condenser for 15 h. Progress of the reaction was monitored by TLC analysis. After completion, the reaction mixture was cooled down to room temperature and the acetonitrile solvent was removed under vacuum. The residue was diluted with water (10 mL) and the product extracted in ethyl acetate (3 × 5 mL). The ethyl acetate layer was washed with the aqueous layer (2 x 5 mL), dried over anhydrous sodium sulfate and evaporated under reduced pressure. The crude product was purified by column chromatography using ethyl acetate/hexane (9: 1, *v/v*) as an eluent.

3-(p-Tolylthio)imidazo[1,2-a]pyridin-2(3H)-one (**3aa**)**:** White solid; yield: 120 mg (82%); mp 205-209 ºC; FTIR *v* (max): 3741, 3008, 2920, 1612, 1512, 1327, 1265, 1072, 887, 748, 663, 516 cm^{-1}; ^1H NMR (400 MHz, DMSO-d_6) δ = 8.17 (d, *J* = 6.6 Hz, 1H), 7.40-7.33 (m, 2H), 7.07-7.01 (m, 3H), 6.92 (d, *J* = 8.2 Hz, 2H), 2.21 (s, 3H); ^{13}C NMR (100 MHz, DMSO-d_6) δ = 165.8, 144.1, 140.4, 138.4, 135.1, 131.9, 130.8, 128.8, 119.2, 116.5, 91.8, 25.6; HRMS (ESI): *m/z* $[M + H]^+$ calcd for $C_{14}H_{13}N_2OS$: 257.0743; found: 257.0752.

3-(Phenylthio)imidazo[1,2-a]pyridin-2(3H)-one (**3ab**)**:** White solid; yield: 79 mg (57%); mp 187-190 °C; FTIR *v* (max): 3066, 2915, 1643, 1616, 1577, 1473, 1330, 1269, 1068, 887, 729, 659, 520 cm^{-1}; ^1H NMR (400 MHz, DMSO-d_6) δ = 8.20 (d, *J* = 6.5 Hz, 1H), 7.42 – 7.34 (m, 2H), 7.26 (t, *J* = 7.5 Hz, 2H), 7.14 (t, *J* = 7.2 Hz, 1H), 7.04 (t, *J* = 6.0 Hz, 1H), 7.00 (d, *J* = 7.4 Hz, 2H); ^{13}C NMR (100 MHz, DMSO-d_6) δ = 161.1, 139.3, 137.4, 129.8,

127.3, 126.2, 125.5, 124.1, 114.7, 111.6, 86.2; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{13}H_{11}N_2OS$: 243.0587; found: 243.0581.

3-(o-Tolylthio)imidazo[1,2-a]pyridin-2(3H)-one (**3ac**)**:** Off white solid; yield: 104 mg (71%); mp 250-253 ºC; FTIR *v* (max): 3741, 3026, 1616, 1525, 1336, 1273, 1070, 889, 749, 669, 516 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-*d*$_6$) *δ* = 8.14 (d, *J* = 6.5 Hz, 1H), 7.42 – 7.35 (m, 2H), 7.21 (d, *J* = 7.1 Hz, 1H), 7.1 – 6.98 (m, 3H), 6.45 (d, *J* = 7.4 Hz, 1H), 2.43 (s, 3H); ^{13}C NMR (100 MHz, DMSO-*d*$_6$) *δ* = 166.0, 144.2, 140.6, 139.5, 135.8, 132.0, 131.9, 130.6, 129.0, 128.9, 119.4, 116.4, 89.8, 24.4; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{14}H_{13}N_2OS$: 257.0743; found: 257.0709.

3-(m-Tolylthio)imidazo[1,2-a]pyridin-2(3H)-one (**3ad**)**:** Off white solid; yield: 94 mg (64%); mp 192-195 ºC; FTIR *v* (max): 3741, 3010, 1620, 1522, 1328, 1267, 1070, 886, 742, 662, 516 cm^{-1}; 1H NMR (400 MHz, DMSO-*d*$_6$) *δ* = 8.18 (d, *J* = 6.3 Hz, 1H), 7.41 – 7.33 (m, 2H), 7.13 (t, *J* = 7.5 Hz, 1H), 7.04 (t, *J* = 6.3 Hz, 1H), 6.95 (d, *J* = 7.2 Hz, 1H), 6.88 (s, 1H), 6.76 (d, *J* = 7.4 Hz, 1H), 2.20 (s, 3H); ^{13}C NMR (100 MHz, DMSO-*d*$_6$) *δ* = 161.2, 139.4, 139.1, 137.2, 129.6, 127.2, 127.0, 126.1, 124.1, 122.7, 114.5, 111.8, 86.5, 21.4; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{14}H_{13}N_2OS$: 257.0743; found: 257.0711.

3-((4-Methoxyphenyl)thio)imidazo[1,2-a]pyridin-2(3H)-one (**3ae**)**:** White solid; yield: 131mg (84%); mp 203-205 ºC; FTIR *v* (max): 3741, 3008, 2954, 1643, 1620, 1512, 1489, 1242, 1033, 887, 748, 663, 524 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-*d*$_6$) *δ* = 8.24 (d, *J* = 6.6 Hz, 1H), 7.39-7.31 (m, 2H), 7.07-7.02 (m, 3H), 6.85 (d, *J* = 8.7 Hz, 2H), 3.68 (s, 3H); ^{13}C NMR (100 MHz, DMSO-*d*$_6$) *δ* = 160.9, 158.5, 139.1, 128.4, 127.5, 127.0, 124.0, 115.5, 114.4, 111.8, 88.2, 55.6; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{14}H_{13}N_2O_2S$: 273.0692; found: 273.0680.

3-((4-(tert-Butyl)phenyl)thio)imidazo[1,2-a]pyridin-2(3H)-one (**3af**)**:** Off white solid; yield: 92 mg (54%); mp 180-184 ºC; FTIR *v* (max): 3010, 2960, 1616, 1473, 1458, 1328, 1072, 883, 748, 663, 501 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-*d*$_6$) *δ* = 8.22 (d, *J* = 6.2 Hz, 1H), 7.40 – 7.33 (m, 2H), 7.27 (d, *J* = 8.0 Hz, 2H), 7.03 (t, *J* = 6.0 Hz, 1H), 6.94 (d, *J* = 8.0 Hz, 2H), 1.20 (s, 9H); ^{13}C NMR (100 MHz, DMSO-*d*$_6$) *δ* = 161.1, 148.9, 139.5, 134.0, 127.1, 126.7, 125.7, 124.1, 114.5, 111.9, 87.0, 34.6, 31.5; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{17}H_{19}N_2OS$: 299.1213; found: 299.1194.

3-((4-Nitrophenyl)thio)imidazo[1,2-a]pyridin-2(3H)-one (**3ag**)**:** Yellow solid; yield: 57 mg (35%); mp 210-213 ºC; ^{1}H NMR (400 MHz, DMSO-*d*$_6$) *δ* = 8.19 (d, *J* = 6.5 Hz, 1H), 8.12 (d, *J* = 8.8 Hz, 2H), 7.47 (t, *J* = 7.7 Hz, 1H), 7.37 (d, *J* = 8.6 Hz, 1H), 7.22 (d, *J* = 8.8 Hz, 2H), 7.08 (t, *J* = 6.6 Hz, 1H); ^{13}C NMR (100 MHz, DMSO-*d*$_6$) *δ* = 160.93, 147.8, 145.7, 139.7, 128.3, 125.5, 124.9, 124.3, 115.2, 111.1, 83.3; FTIR *v* (max): 3741, 3060, 2978, 1620, 1573, 1496, 1334, 1080, 840, 740, 671, 524 cm^{-1}; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{13}H_{10}N_3O_3S$: 288.0437; found: 288.0432.

3-((4-Fluorophenyl)thio)imidazo[1,2-a]pyridin-2(3H)-one (**3ah**)**:** Off white solid; yield: 66 mg (44%); mp 215-218 ºC; FTIR *v* (max): 3047, 1643, 1614, 1485, 1267, 1209, 1076, 873, 750, 661, 524, 426 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-*d*$_6$) *δ* = 8.23 (d, *J* = 6.4 Hz, 1H), 7.40 (t, *J* = 8 Hz, 1H), 7.33 (d, *J* = 8.4 Hz, 1H), 7.15 – 7.03 (m, 5H); ^{13}C NMR (100 MHz, DMSO-*d*$_6$) *δ* = 165.9 (d, $J_{C\text{-}F}$ = 248 Hz), 165.8, 143.9, 137.7, 132.7 (d, $J_{C\text{-}F}$ = 1.2 Hz), 132.2, 128.8 (d, $J_{C\text{-}F}$ = 4.6 Hz), 128.8, 121.6, 120.4, (d, $J_{C\text{-}F}$ = 21.2 Hz), 116.3, 91.4; ^{19}F NMR (376 MHz, DMSO-*d*$_6$) *δ* = -108.89, -112.35; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{13}H_{10}FN_2OS$: 261.0492; found: 261.0453.

3-((4-Chlorophenyl)thio)imidazo[1,2-a]pyridin-2(3H)-one (**3ai**)**:** Off white solid; yield: 75 mg (47%); mp 232-235 ºC; FTIR *v* (max): 3741, 3024, 2978, 1643, 1620, 1512, 1419, 1265, 1080, 887, 756, 663, 524 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-*d*$_6$) *δ* = 8.19 (d, *J* = 6.2 Hz, 1H), 7.42 (t, *J* = 7.6, 1H), 7.35-7.31 (m, 3H), 7.07-7.01 (m, 3H); ^{13}C NMR (100 MHz, DMSO-*d*$_6$) *δ* = 161.0, 139.1, 136.6, 130.7, 129.7, 127.7, 127.2, 124.2, 114.9, 111.4, 85.5; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{13}H_{10}ClN_2OS$: 277.0197; found: 277.0168.

3-((4-Bromophenyl)thio)imidazo[1,2-a]pyridin-2(3H)-one (**3aj**)**:** Off white solid; yield: 92 mg (50%); mp 235-238 ºC; FTIR *v* (max): 3062, 2925, 1643, 1620, 1512, 1465, 1072, 887, 756, 663, 524 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-*d*$_6$) *δ* = 8.19 (d, *J* = 6.4 Hz, 1H), 7.46-7.40 (m, 3H), 7.34 (d, *J* = 8.5 Hz, 1H), 7.06 (t, *J* = 6.6 Hz, 1H), 6.95 (d, *J* = 8.3 Hz, 2H); ^{13}C NMR (100 MHz, DMSO-*d*$_6$) *δ* = 161.0, 139.1, 137.2, 132.5, 127.7, 127.5, 124.2, 118.9, 114.9, 111.4, 85.3; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{13}H_{10}BrN_2OS$: 320.9692; found: 320.9666.

3-((2-Bromophenyl)thio)imidazo[1,2-a]pyridin-2(3H)-one (**3ak**): Off white solid; yield: 101 mg (55% yield); mp 238-241 ºC; FTIR *v* (max): 3741, 3055, 2915, 1643, 1612, 1550, 1442, 1273, 894, 748, 655, 524 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-*d*$_6$) *δ* 8.14 (d, *J* = 6.3 Hz, 1H), 7.62 (d, *J* = 7.7 Hz, 1H), 7.45 (t, *J* = 7.8 Hz, 1H), 7.36 (d, *J* = 8.4 Hz, 1H), 7.19 (t, *J* = 7.3 Hz, 1H), 7.10-7.05 (m, 2H), 6.44 (d, *J* = 7.6 Hz, 1H); ^{13}C NMR (100 MHz, DMSO-*d*$_6$) *δ* 161.1, 139.1, 137.9, 133.6, 128.8, 128.0, 127.6, 125.6, 124.2, 119.5, 115.1, 111.1, 84.3; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{13}H_{10}BrN_2OS$: 320.9692; found: 320.9695.

8-Methyl-3-(phenylthio)imidazo[1,2-a]pyridin-2(3H)-one (**3bb**): Off white solid; yield: 77 mg (55%); mp 230-233 ºC; FTIR *v* (max): 3741, 3062, 2920, 1616, 1597, 1573, 1473, 1234, 1080, 879, 840, 748, 686, 586 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-*d*$_6$) *δ* = 8.03 (d, *J* = 6.4 Hz, 1H), 7.26-7.20 (m, 3H), 7.12 (t, *J* = 7.2 Hz, 1H), 6.99 – 6.92 (m, 3H), 2.42 (s, 3H); ^{13}C NMR (100 MHz, DMSO-*d*$_6$) *δ* = 161.2, 139.9, 137.4, 129.7, 127.6, 126.9, 126.1, 125.5, 121.9, 114.3, 86.6, 16.3; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{14}H_{13}N_2OS$: 257.0743; found: 257.0740.

7-Methyl-3-(phenylthio)imidazo[1,2-a]pyridin-2(3H)-one (**3cb**): Off white solid; yield: 78 mg (56%); mp 188-191 ºC; FTIR *v* (max): 3062, 2962, 1654, 1593, 1543, 1473, 1265, 1080, 887, 736, 690, 586 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-*d*$_6$) *δ* = 8.06 (d, *J* = 6.6 Hz, 1H), 7.25 (t, *J* = 7.4 Hz, 2H), 7.15-7.11 (m, 2H), 6.98 (d, *J* = 7.6 Hz, 2H), 6.93 (d, *J* = 6.8 Hz, 1H), 2.36 (s, 3H); ^{13}C NMR (100 MHz, DMSO-*d*$_6$) *δ* = 160.9, 138.8, 137.9, 129.7, 126.0, 125.3, 123.6, 116.7, 110.3, 84.4, 21.1; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{14}H_{13}N_2OS$: 257.0743; found: 257.0738.

6-Methyl-3-(phenylthio)imidazo[1,2-a]pyridin-2(3H)-one (**3db**): Off white solid; yield: 70 mg, (50%); mp 237-241 ºC; FTIR *v* (max): 3741, 3039, 2915, 1647, 1597, 1512, 1465, 1311, 1072, 887, 756, 655, 578 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-*d*$_6$) *δ* = 8.05 (s, 1H), 7.26 (t, *J* = 6.7 Hz, 4H), 7.14 (t, *J* = 7.4 Hz, 1H), 6.99 (d, *J* = 7.1 Hz, 2H), 2.26 (s, 3H); ^{13}C NMR (100 MHz, DMSO-*d*$_6$) *δ* = 160.9, 137.8, 137.4, 129.7, 129.6, 126.1, 125.4, 124.3, 122.2, 110.8, 85.8, 18.0; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{14}H_{13}N_2OS$: 257.0743, found: 257.0746.

6-Chloro-3-(phenylthio)imidazo[1,2-a]pyridin-2(3H)-one (**3eb**): Off white solid; yield: 94 mg (67%); mp 239-242 ºC; FTIR *v* (max): 3741, 3008, 2924, 1604, 1558, 1512, 1465, 1296, 1064, 879, 748, 655, 563 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-*d*$_6$) *δ* = 8.29 (s, 1H), 7.43 (d, *J* = 1.4 Hz, 2H), 7.28 (t, *J* = 7.7 Hz, 2H), 7.17 (t, *J* = 7.4 Hz, 1H), 7.02 (d, *J* = 7.4 Hz, 2H); ^{13}C NMR (100 MHz, DMSO-*d*$_6$) *δ* = 162.0, 139.4, 136.6, 129.9, 127.2, 126.4, 125.8, 121.8, 120.8, 114.0, 89.0; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{13}H_{10}ClN_2OS$: 277.0197; found: 277.0204.

6-Bromo-3-(phenylthio)imidazo[1,2-a]pyridin-2(3H)-one (**3fb**): Off white solid; yield: 99 mg (70%); mp 237-240 ºC; FTIR *v* (max): 3741, 3062, 2933, 1612, 1558, 1512, 1465, 1303, 1056, 794, 740, 648, 570 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-*d*$_6$) *δ* = 8.32 (d, *J* = 1.3 Hz, 1H), 7.51 (dd, *J* = 9.2, 1.8 Hz, 1H), 7.37 (d, *J* = 9.2 Hz, 1H), 7.28 (t, *J* = 7.5 Hz, 2H), 7.17 (t, *J* = 7.3 Hz, 1H), 7.02 (d, *J* = 7.4 Hz, 2H); ^{13}C NMR (100 MHz, DMSO-*d*$_6$) *δ* = 161.9, 139.5, 136.6, 129.9, 129.5, 126.4, 125.8, 123.7, 114.3, 107.5, 88.8; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{13}H_{10}BrN_2OS$: 320.9692; found: 320.9689.

6-Iodo-3-(phenylthio)imidazo[1,2-a]pyridin-2(3H)-one (**3gb**): Off white solid; yield: 99 mg (69%); mp 235-238 ºC; FTIR *v* (max): 3741, 3062, 2962, 1681, 1612, 1558, 1465, 1296, 1018, 794, 740, 648 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-*d*$_6$) *δ* = 8.32 (s, 1H), 7.59 (d, *J* = 8.6 Hz, 1H), 7.30-7.22 (m,

3H), 7.17 (t, *J* = 7.0 Hz, 1H), 7.02 (d, *J* = 7.4 Hz, 2H); ^{13}C NMR (100 MHz, DMSO) *δ* = 161.4, 139.4, 136.8, 134.4, 129.9, 128.1, 126.4, 125.7, 114.3, 87.8, 77.6; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{13}H_{10}IN_2OS$: 368.9553; found: 368.9524.

8-Amino-6-bromo-3-(phenylthio)imidazo[1,2-a]pyridin-2(3H)-one (**3hb**): Off white solid, yield: 114 mg (80%); mp 241-244 ºC; FTIR ν (max): 3741, 3448, 3140, 2970, 1705, 1658, 1597, 1566, 1419, 1257, 1018, 995, 879, 756, 686, 601 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 7.56 (d, J = 1.7 Hz, 1H), 7.28 (t, J = 7.5 Hz, 2H), 7.17 (t, J = 7.3 Hz, 1H), 7.00 (d, J = 7.3 Hz, 2H), 6.58 (d, J = 1.7 Hz, 1H), 5.85 (s, 2H); ^{13}C NMR (100 MHz, DMSO-d_6) δ = 160.8, 137.0, 136.4, 133.1, 129.9, 126.3, 125.7, 111.7, 108.5, 107.2, 89.6; HRMS (ESI): m/z [M + H]$^+$ calcd for $C_{13}H_{11}BrN_3OS$: 335.9801; found: 335.9768.

6-Phenyl-3-(phenylthio)imidazo[1,2-a]pyridin-2(3H)-one (**3ib**): White solid; yield: 103 mg (73%); mp 212-215 ºC; FTIR *ν* (max): 3062, 2985, 1643, 1620, 1512, 1473, 1265, 1072, 887, 756, 663, 524 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) *δ* = 8.30 (s, 1H), 7.71 (dd, *J* = 8.9, 1.1 Hz, 1H), 7.59 (d, *J* = 7.4 Hz, 2H), 7.46 (t, *J* = 8.1 Hz, 3H), 7.38 (t, *J* = 7.2 Hz, 1H), 7.26 (t, *J* = 7.5 Hz, 2H), 7.13 (t, *J* = 7.3 Hz, 1H), 7.05 (d, *J* = 7.5 Hz, 2H); ^{13}C NMR (100 MHz, DMSO-d_6) *δ* = 161.7, 139.2, 137.2, 136.7, 129.8, 129.7, 128.4, 127.5, 127.0, 126.6, 126.3, 125.7, 120.7, 112.4, 87.5; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{19}H_{15}N_2OS$: 319.0900; found: 319.0907.

6-(4-Methoxyphenyl)-3-(phenylthio)imidazo[1,2-a]pyridin-2(3H)-one (**3jb**): White solid; yield: 90 mg (63%); mp 227-230 ºC; FTIR *ν* (max): 3741, 3047, 2955, 1604, 1566, 1473, 1249, 1172, 1026, 825, 794, 663, 532 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) *δ* 8.19 (s, 1H), 7.69 (d, *J* = 9.1 Hz, 1H), 7.50 (d, *J* = 8.3 Hz, 2H), 7.41 (d, *J* = 9.0 Hz, 1H), 7.24 (t, *J* = 7.7 Hz, 2H), 7.12 (t, *J* = 7.3 Hz, 1H), 7.02 (t, *J* = 8.9 Hz, 4H), 3.75 (s, 3H); ^{13}C NMR (100 MHz, DMSO-d_6) *δ* 161.4, 159.7, 138.6, 137.2, 129.8, 128.9, 128.2, 127.4, 126.5, 126.2, 125.6, 120.0, 115.1, 112.0, 87.1, 55.7 cm^{-1}; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{20}H_{17}N_2O_2S$: 349.1005; found: 349.1004.

6-(4-Chlorophenyl)-3-(phenylthio)imidazo[1,2-a]pyridin-2(3H)-one (**3kb**): Off white solid; yield: 107 mg (75%); mp 245-248 ºC; FTIR *ν* (max): 3741, 3023, 2978, 1612, 1558, 1473, 1319, 1010, 802, 748, 694, 532 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) *δ* 8.31 (s, 1H), 7.73 (d, *J* = 9.0, Hz, 1H), 7.62 (d, *J* = 8.2 Hz, 2H), 7.51-7.44 (m, 3H), 7.24 (t, *J* = 7.6 Hz, 2H), 7.13 (t, *J* = 7.3 Hz, 1H), 7.03 (d, *J* = 7.7 Hz, 2H); ^{13}C NMR (100 MHz, DMSO-d_6) *δ* 161.7, 137.2, 135.6, 133.3, 130.0, 129.8, 129.6, 128.9, 127.7, 126.4, 126.3, 125.7, 120.9, 112.6, 87.7; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{19}H_{14}ClN_2OS$: 353.0510; found: 353.0513.

6-(1H-Indol-1-yl)-3-(phenylthio)imidazo[1,2-a]pyridin-2(3H)-one (**3lb**): Off white solid; yield: 78 mg (55%); mp 238-241 ºC; FTIR *ν* (max): 3741, 3047, 1604, 1566, 1473, 1249, 1172, 1026, 894, 748, 655, 524 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) *δ* = 8.28 (s, 1H), 7.64 – 7.56 (m, 4H), 7.29 (t, *J* = 6 Hz, 2H), 7.19 (t, *J* = 7.3 Hz, 2H), 7.13-7.07 (m, 4H), 6.69 (s, 1H); ^{13}C NMR (100 MHz, DMSO-d_6) *δ* = 162.1, 139.0, 136.3, 136.1, 129.9, 129.3, 128.0, 126.5, 126.1, 124.6, 122.9, 121.5, 120.9, 119.4, 113.4, 110.2, 104.3, 88.9; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{21}H_{16}N_3OS$: 358.1009; found: 358.0988.

3-(Phenylthio)-6-(1H-pyrazol-1-yl)imidazo[1,2-a]pyridin-2(3H)-one (**3mb**): Off white solid; yield: 56 mg (40%); mp 245-248 ºC; FTIR *ν* (max): 3741, 3124, 2978, 1604, 1527, 1396, 1188, 1049, 887, 740, 665, 563 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) *δ* = 8.62 (d, *J* = 1.2 Hz, 1H), 8.54 (d, *J* = 2.2 Hz, 1H), 7.93 (dd, *J* = 9.3, 1.8 Hz, 1H), 7.73 (s, 1H), 7.53 (d, *J* = 9.3 Hz, 1H), 7.27 (t, *J* = 7.6 Hz, 2H), 7.15 (t, *J* = 7.2 Hz, 1H), 7.04 (d, *J* = 7.5 Hz, 2H), 6.55 (t, *J* = 2.1 Hz, 1H); ^{13}C NMR (100 MHz, DMSO-d_6) *δ* = 162.1, 141.9, 138.8, 136.9, 129.9, 129.0, 126.3, 125.6, 119.1, 114.1, 113.1, 108.6, 88.8; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{16}H_{13}N_4OS$: 309.0805; found: 309.0785.

6-Methyl-3-(p-tolylthio)imidazo[1,2-a]pyridin-2(3H)-one (**3da**): Off white solid; yield: 93 mg (63%); mp 235-238 ºC; FTIR *ν* (max): 3341, 3047, 1604, 1558, 1465, 1319, 1242, 1112, 884, 756, 655, 524 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) *δ* = 8.03 (s, 1H), 7.24 (s, 2H), 7.08 (d, *J* = 8.0 Hz, 2H), 6.91 (d, *J* = 8.0 Hz, 2H), 2.26 (s, 3H), 2.22 (s, 3H); ^{13}C NMR (100 MHz, DMSO-d_6) *δ* = 161.0, 137.5, 135.5, 134.1, 130.3, 129.4, 125.8, 124.1, 122.1, 111.0, 86.5, 20.9, 18.0; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{15}H_{15}N_2OS$: 271.0900; found: 271.0891.

6-Bromo-3-(p-tolylthio)imidazo[1,2-a]pyridin-2(3H)-one (**3fa**): Off white solid; yield: 65 mg (44%); mp 232-235 ºC; FTIR *ν* (max): 3741, 3039, 2950, 1643, 1581, 1496, 1311, 1056, 802, 648, 565 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) *δ* = 8.28 (d, *J* = 1.3 Hz, 1H), 7.49 (dd, *J* = 9.2, 1.9 Hz, 1H), 7.36 (d, *J* = 9.2 Hz, 1H), 7.09 (d, *J* = 8.0 Hz, 2H), 6.94 (d, *J* = 8.2 Hz, 2H), 2.22 (s, 3H); ^{13}C NMR (100 MHz, DMSO-d_6) *δ* = 161.8, 139.4, 136.0, 132.9, 130.5, 129.3, 126.3, 123.6, 114.3, 107.4, 89.5, 20.9; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{14}H_{12}BrN_2OS$: 334.9848; found: 334.9840.

8-Amino-6-bromo-3-(p-tolylthio)imidazo[1,2-a]pyridin-2(3H)-one (**3ha**): Off white solid; yield: 126 mg (85%); mp 272-235 ºC; FTIR *ν* (max): 3414, 3199, 2924, 1654, 1587, 1570, 1489, 1274, 1068, 877, 750, 675, 551 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) *δ* = 7.53 (s, 1H), 7.09 (d, *J* = 7.4 Hz, 2H), 6.91 (d, *J* = 7.4 Hz, 2H), 6.55 (s, 1H), 5.86 (s, 2H), 2.22 (s, 3H); ^{13}C NMR (100 MHz, DMSO-d_6) *δ* = 160.8, 136.3, 135.8, 133.3, 133.0, 130.5, 126.1, 111.7, 108.4, 107.0, 90.1, 20.9; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{14}H_{13}BrN_3OS$: 349.9957; found: 349.9918.

6-Phenyl-3-(p-tolylthio)imidazo[1,2-a]pyridin-2(3H)-one (**3ia**): Off white solid; yield: 89 mg (61%); mp 230-233 ºC; FTIR *ν* (max): 3741, 3070, 2985, 1643, 1604, 1519, 1319, 1227, 1080, 810, 756, 663, 516 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) *δ* 8.30 (s, 1H), 7.72 (d, *J* = 9.1 Hz, 1H), 7.62 (d, *J* = 7.6 Hz, 2H), 7.47 (t, *J* = 8.3 Hz, 3H), 7.40 (t, *J* = 7.3 Hz, 1H), 7.09 (d, *J* = 7.9 Hz, 2H), 6.98 (d, *J* = 7.8 Hz, 2H), 2.21 (s, 3H); ^{13}C NMR (100 MHz, DMSO-d_6) *δ* 161.5, 146.2, 136.7, 135.8, 133.4, 130.5, 129.7, 128.5, 127.5, 127.0, 126.5, 126.1, 122.5, 120.6, 112.3, 86.3, 21.1; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{20}H_{17}N_2OS$: 333.1056; found: 333.1043.

6-(1H-Indol-1-yl)-3-(p-tolylthio)imidazo[1,2-a]pyridin-2(3H)-one (**3la**): Off white solid; yield: 98 mg (66%); mp 224-227 ºC; FTIR *ν* (max): 3741, 3047, 1604, 1566, 1473, 1249, 1172, 1026, 889, 748, 655, 524 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) *δ* = 8.25 (s, 1H), 7.65 - 7.55 (m, 4H), 7.13 – 7.05 (m, 5H), 6.98 (d, *J* = 7.9 Hz, 2H), 6.70 (d, *J* = 2.7 Hz, 1H), 2.23 (s, 3H); ^{13}C NMR (100 MHz, DMSO-d_6) *δ* 162.0, 136.1, 136.0, 132.5, 130.5, 129.3, 129.2, 127.9, 126.5, 124.5, 122.9, 121.5, 121.0, 119.2, 113.4, 110.2, 104.3, 89.4, 20.9; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{22}H_{18}N_3OS$: 372.1165; found: 372.1152.

6-(1H-Pyrazol-1-yl)-3-(p-tolylthio)imidazo[1,2-a]pyridin-2(3H)-one (**3ma**): Off white solid; yield: 62 mg (42%); mp 260-263 ºC; FTIR *ν* (max): 3116, 3010, 1616, 1558, 1489, 1398, 1249, 1192, 1080, 883, 742, 657, 518 cm^{-1}; ^{1}H NMR (400 MHz, DMSO) *δ* = 8.61 (s, 1H), 8.53 (s, 1H), 7.91 (d, *J* = 9.1 Hz, 1H), 7.74 (s, 1H), 7.52 (d, *J* = 9.2 Hz, 1H), 7.08 (d, *J* = 7.6 Hz, 2H), 6.96 (d, *J* = 7.7 Hz, 2H), 6.55 (s, 1H), 2.21 (s, 3H); ^{13}C NMR (100 MHz, DMSO) *δ* = 162.0, 141.8, 138.7, 135.9, 133.1, 130.5, 129.8, 129.0, 126.0, 119.0, 114.1, 113.2, 108.6, 89.4, 20.9; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{17}H_{15}N_4OS$: 323.0961; found: 323.0953.

3-((4-(tert-Butyl)phenyl)thio)-6-methylimidazo[1,2-a]pyridin-2(3H)-one (**3df**): Off white solid; yield: 68 mg (40%); mp 225-228 ºC; FTIR *ν* (max): 3010, 2953, 1608, 1558, 1473, 1276, 1014, 817, 750, 659, 538 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) *δ* = 8.08 (s, 1H), 7.28 – 7.24 (m, 4H), 6.93 (d, *J* = 8.2 Hz, 2H), 2.26 (s, 3H), 1.20 (s, 9H); ^{13}C NMR (100 MHz, DMSO-d_6) *δ* = 160.5, 148.9, 136.5, 134.3, 129.8, 126.6, 125.6, 124.6, 122.2, 110.3, 86.4, 34.5, 31.5, 18.0; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{18}H_{21}N_2OS$: 313.1369; found: 313.1361.

6-Bromo-3-((4-(tert-butyl)phenyl)thio)imidazo[1,2-a]pyridin-2(3H)-one (**3ff**): Off white solid; yield: 97 mg (58%); mp 258-261 ºC; FTIR *ν* (max): 3062, 2949, 1616, 1560, 1463, 1301, 1213, 1012, 804, 731, 540 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) *δ* = 8.35 (s, 1H), 7.49 (dd, *J* = 9.2, 1.5 Hz, 1H),

7.37 (d, *J* = 9.2 Hz, 1H), 7.29 (d, *J* = 8.4 Hz, 2H), 6.96 (d, *J* = 8.3 Hz, 2H), 1.20 (s, 9H); ^{13}C NMR (100 MHz, DMSO-d_6) δ = 161.8, 149.2, 139.5, 133.2, 129.3, 126.8, 125.9, 123.7, 114.4, 107.4, 89.5, 34.6, 31.5; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{17}H_{18}BrN_2OS$: 377.0318; found 377.0285.

3-((4-(*tert*-Butyl)phenyl)thio)-6-phenylimidazo[1,2-*a*]pyridin-2(3*H*)-one (**3if**): Off white solid; yield: 70 mg (42%); mp 228-231 ºC; FTIR *v* (max): 3010, 2975, 1643, 1608, 1473, 1276, 1014, 887, 810, 659, 538 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 8.34 (s, 1H), 7.71 (d, *J* = 8.7 Hz, 1H), 7.61 (d, *J* = 7.2 Hz, 2H), 7.47 (t, *J* = 4.8 Hz, 3H), 7.39 (t, *J* = 7 Hz, 1H), 7.27 (d, *J* = 8.0 Hz, 2H), 6.98 (d, *J* = 8.0 Hz, 2H), 1.18 (s, 9H); ^{13}C NMR (100 MHz, DMSO-d_6) δ = 166.2, 153.8, 143.8, 141.4, 138.5, 134.4, 133.2, 132.2, 131.8, 131.5, 131.3, 130.6, 125.4, 117.2, 92.8, 39.3, 36.2; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{23}H_{23}BN_2OS$: 375.1526; found: 375.1513.

3-((4-Chlorophenyl)thio)-6-methylimidazo[1,2-*a*]pyridin-2(3*H*)-one (**3di**): White solid; yield: 65 mg (41%); mp 245-248 ºC; FTIR v (max): 3741, 2985, 1643, 1604, 1473, 1087, 956, 802, 572 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 8.04 (s, 1H), 7.33-7.23 (m, 4H), 7.01 (d, J = 8.5 Hz, 2H), 2.26 (s, 3H); ^{13}C NMR (100 MHz, DMSO-d_6) δ = 160.9, 137.1, 137.0, 130.6, 129.9, 129.6, 127.1, 124.6, 122.2, 110.5, 85.1, 18.0; HRMS (ESI): m/z [M + H]$^+$ calcd for $C_{14}H_{12}ClN_2OS$: 291.0353; found: 291.0315.

6-Bromo-3-((4-chlorophenyl)thio)imidazo[1,2-a]pyridin-2(3H)-one (**3fi**): White solid; yield: 77 mg (60%); mp 234-237 ºC; FTIR *v* (max): 3741, 2987, 1642, 1608, 1473, 1086, 956, 799, 571 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 8.34 (s, 1H), 7.52 (d, *J* = 9.0 Hz, 1H), 7.37 – 7.32 (m, 3H), 7.04 (d, *J* = 8.2 Hz, 2H); ^{13}C NMR (100 MHz, DMSO-d_6) δ = 161.8, 139.3, 135.9, 131.0, 129.8, 127.6, 123.8, 114.0, 107.7, 88.2; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{13}H_9ClBrN_2OS$: 354.9302; found: 354.9269.

8-Amino-6-bromo-3-((4-chlorophenyl)thio)imidazo[1,2-a]pyridin-2(3H)-one (**3hi**)**:** Off white solid; yield: 109 mg (70%); mp 245-247 ºC; FTIR *v* (max): 3414, 3033, 2967, 1623, 1567, 1473, 1069, 887, 551 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 7.56 (d, *J* = 1.8 Hz, 1H), 7.33 (d, *J* = 8.4 Hz, 2H), 6.99 (d, *J* = 8.4 Hz, 2H), 6.58 (d, *J* = 1.7 Hz, 1H), 5.89 (s, 2H); ^{13}C NMR (100 MHz, DMSO) δ = 160.9, 136.3, 136.2, 133.0, 130.9, 129.8, 127.4, 111.7, 108.7, 107.5, 88.9; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{13}H_{10}BrClN_3OS$: 369.9411; found: 369.9395.

3-((4-Chlorophenyl)thio)-6-phenylimidazo[1,2-a]pyridin-2(3H)-one (**3ii**): Off white solid; yield: 85 mg (54%); mp 248-251 ºC; FTIR *v* (max): 3018, 2954, 1637, 1606, 1558, 1473, 1274, 1087, 815, 756, 661, 518 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.31 (s, 1H), 7.74 (d, *J* = 8.9 Hz, 1H), 7.62 (d, *J* = 7.5 Hz, 2H), 7.47 (t, *J* = 6.9 Hz, 3H), 7.40 (t, *J* = 7.1 Hz, 1H), 7.32 (d, *J* = 8.4 Hz, 2H), 7.06 (d, *J* = 8.4 Hz, 2H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 161.6, 136.6, 136.5, 130.8, 129.7, 129.6, 128.5, 127.7, 127.4, 127.1, 126.9, 120.7, 112.2, 86.7; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{19}H_{14}ClN_2OS$: 353.0510; found: 353.0500.

3-((4-Chlorophenyl)thio)-6-(1H-pyrazol-1-yl)imidazo[1,2-a]pyridin-2(3H)-one (**3mi**): White solid; yield: 55 mg (35%); mp 255-259 ºC; FTIR *v* (max): 3741, 3008, 2927, 1620, 1606, 1558, 1469, 1274, 1010, 835, 756, 661, 518 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 8.57 (s, 1H), 8.45 (s, 1H), 7.92 (d, *J* = 9.3 Hz, 1H), 7.73 (s, 1H), 7.48 (d, *J* = 9.4 Hz, 1H), 7.30 (d, *J* = 8.2 Hz, 2H), 7.06 (d, *J* = 8.2 Hz, 2H), 6.55 (s, 1H); ^{13}C NMR (100 MHz, DMSO) δ = 161.5, 142.0, 137.7, 136.1, 131.0, 130.3, 129.8, 129.0, 127.3, 119.5, 114.1, 112.3, 108.7, 87.8; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{16}H_{12}ClN_4OS$: 343.0415; found 343.0399.

3-((2-Bromophenyl)thio)-6-methylimidazo[1,2-a]pyridin-2(3H)-one (**3dk**): Off white solid; yield: 60 mg (33%); mp 252-255 ºC; FTIR *v* (max): 3741, 2972, 1643, 1604, 1512, 1303, 1087, 810, 740, 640, 578 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.98 (s, 1H), 7.61 (dd, *J* = 7.8, 1.2 Hz, 1H), 7.33 – 7.25 (m, 2H), 7.18 (dt, *J* = 7.5, 1.3 Hz, 1H), 7.08 (dt, *J* = 7.7, 1.6 Hz, 1H), 6.44 (dd, *J* = 7.9, 1.4 Hz, 1H), 2.26 (s, 3H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 161.0, 138.3, 137.5, 133.5, 130.2, 128.8, 127.5, 125.5, 124.7, 122.3, 119.4, 110.5, 83.9, 17.9; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{14}H_{12}BrN_2OS$: 334.9848; found: 334.9841

6-Bromo-3-((2-bromophenyl)thio)imidazo[1,2-a]pyridin-2(3H)-one (**3fk**): Off white solid; yield 109 mg (62%); mp 242-245 ºC; FTIR *v* (max): 3741, 3070, 1643, 1597, 1419, 1296, 1018, 810, 748, 624 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 8.27 (s, 1H), 7.64 (d, *J* = 7.6 Hz, 1H), 7.56 (d, *J* = 8.9 Hz, 1H), 7.38 (d, *J* = 9.0 Hz, 1H), 7.20 (t, *J* = 7.2 Hz, 1H), 7.10 (t, *J* = 7.2 Hz, 1H), 6.45 (d, *J* = 7.5 Hz, 1H); ^{13}C NMR (100 MHz, DMSO-d_6) δ = 161.8, 139.5, 137.4, 133.6, 130.0, 129.0, 127.8, 125.8, 123.9, 119.6, 113.8, 107.9, 86.9; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{13}H_9Br_2N_2OS$: 398.8797; found 398.8767.

3-((2-Bromophenyl)thio)-6-phenylimidazo[1,2-a]pyridin-2(3H)-one (**3ik**): Off white solid; yield: 100 mg (57%); mp 242-245 ºC; FTIR *v* (max): 3080, 2916, 1643, 1565, 1435, 1265, 1157, 1018, 810, 740, 624 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 8.29 (s, 1H), 7.75 (d, *J* = 8.3 Hz, 1H), 7.67-7.60 (m, 3H), 7.51 (t, *J* = 6.8 Hz, 4H), 7.18 (t, *J* = 6.9 Hz, 1H), 7.07 (t, *J* = 6.9 Hz, 1H), 6.50 (d, *J* = 7.2 Hz, 1H); ^{13}C NMR (100 MHz, DMSO-d_6) δ = 161.6, 139.4, 137.9, 135.4, 133.6, 133.4, 129.6, 129.0, 128.9, 127.7, 127.0, 127.0, 125.8, 121.0, 119.6, 112.2, 85.9; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{19}H_{14}BrN_2OS$: 397.0005; found: 397.9956.

3-((2-Bromophenyl)thio)-6-(4-methoxyphenyl)imidazo[1,2-a]pyridin-2(3H)-one (**3jk**): Off white solid; yield: 88 mg (51%); mp 227-230 ºC; FTIR *v* (max): 3085, 2989, 1653, 1610, 1558, 1489, 1317, 1261, 1093, 806, 748, 642, 418 cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) δ = 8.11 (s, 1H), 7.73 (d, *J* = 9.0 Hz, 1H), 7.58 (d, *J* = 7.9 Hz, 1H), 7.49 (d, *J* = 8.3 Hz, 2H), 7.42 (d, *J* = 9.0 Hz, 1H), 7.16 (t, *J* = 7.5 Hz, 1H), 7.06 (t, *J* = 7.6 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 2H), 6.53 (d, *J* = 8.0 Hz, 1H), 3.74 (s, 3H); ^{13}C NMR (100 MHz, DMSO) δ = 160.7, 159.8, 158.7, 139.5, 137.6, 133.6, 128.9, 128.5, 128.3, 128.1, 127.9, 127.6, 125.9, 120.0, 119.7, 115.2, 85.2, 55.7; HRMS (ESI): *m/z* [M + H]$^+$ calcd for $C_{20}H_{16}BrN_2O_2S$: 427.0110; found: 427.0096.

Procedure for synthesis of imidazo[1,2-*a*]pyridin-2(3*H*)-one (4).

An oven-dried round bottom flask (10 mL) was charged with 2-aminopyridinium bromide (**1a,** 1.0 mmol) in CH_3CN (3 mL) solvent. The resulting reaction mixture was heated to 110 °C with condenser for 5 h. After completion, the reaction mixture was cooled down to room temperature and the acetonitrile solvent was removed under vacuum. The residue was washed with diethyl ether (2 × 5 mL) and the solid was dried under reduced pressure to give **4**.

Imidazo[1,2-a]pyridin-2(3H)-one (**4**):[25] Off white solid; yield: 79 mg (59%); FTIR *v* (max): 3121, 2967, 1626, 914, 885, cm^{-1}; ^{1}H NMR (400 MHz, DMSO-d_6) δ ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.79 (d, *J* = 6.4 Hz, 1H), 8.41 (t, *J* = 8.2 Hz, 1H), 7.60 – 7.55 (m, 2H), 5.30 (s, 2H).

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Keywords: 2-aminopyridinium salt • amidation • cyclization • imidazo[1,2-*a*]pyridine-2(3*H*)one • sulfenylation.

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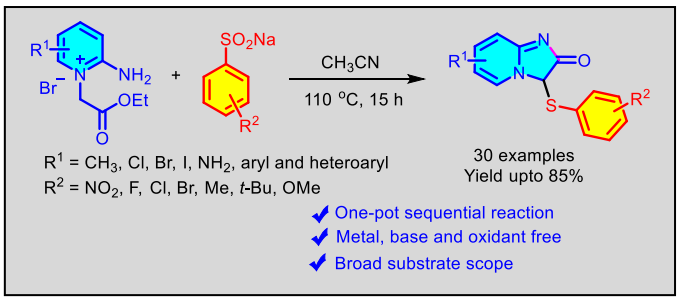

Synthesis of 3-(arylthio)imidazo[1,2-*a*]pyridin-2-ols has been achieved via a catalyst-free, one-pot reaction of 2-aminopyridinium bromides with sodium arenesulfinates. The tandem reaction involved intramolecular amidation followed by sulfenylation and afforded a wide range of 3-(arylthio)imidazo[1,2-*a*]pyridin-2-ols in moderate to excellent (33-85%) yields. The method exhibited broad substrate scope with a wide range of functional group tolerance, and is amenable for gram-scale synthesis.