

**Covalently anchored 2-amino ethyl-3-propyl imidazolium bromide on SBA-15 as a green, efficient and reusable Brønsted basic ionic liquid nanocatalyst for one-pot solvent-free synthesis of benzopyranopyrimidines under ultrasonic irradiation**

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## **Supporting Information**

- 1) Spectroscopic data of some of the representative products**
- 2)  $^1\text{H}$  NMR and  $^{13}\text{C}$  NMR spectra of products**

### 1) Spectroscopic data of some of the representative products

2-[4-(dimethylamino)-5H-chromeno[2,3-d]pyrimidin-2-yl]phenol (Entry 1): White powder (80%); m.p: 178–180 °C. IR (KBr,  $\text{cm}^{-1}$ ): 3425, 3048, 1610, 1150, 1057, 1028.  $^1\text{H}$  NMR (500.1 MHz,  $\text{CDCl}_3$ ):  $\delta\text{H}$  (ppm) 3.15 (6H, s,  $\text{N}(\text{CH}_3)_2$ ), 4.10 (2H, s,  $\text{CH}_2$ ), 6.89 (t, 1H, H-Ar), 7.01 (d, 1H), 7.08 (1H, t), 7.16-7.29 (3H, m), 7.34 (t, 1H), 8.39 (d, 1H), 13.25 (1H, s, OH).  $^{13}\text{C}$  NMR (125.7 MHz,  $\text{CDCl}_3$ ):  $\delta\text{C}$  (ppm) 27.1 ( $\text{CH}_2$ ), 42.5 ( $\text{N}(\text{CH}_3)_2$ ), 98.6, 117.0, 117.5, 118.8, 119.5, 124.0, 128.1, 128.6, 129.1, 132.7, 150.5, 160.5, 161.6, 163.3 (aromatic).

2-(4-Morpholino-5H-chromeno[2,3-d]pyrimidin-2-yl)phenol (Entry 2): White powder (90%); m.p. 199-201 °C; IR (KBr,  $\text{cm}^{-1}$ ): 3438, 1632, 1610, 1250, 1110, 1017.  $^1\text{H}$  NMR (500.1 MHz,  $\text{CDCl}_3$ ):  $\delta\text{H}$  (ppm) 3.48 (4H, t,  $\text{N}(\text{CH}_2\text{CH}_2)$ ), 3.82 (2H, s,  $\text{CH}_2$ ), 3.90 (4H, t,  $\text{O}(\text{CH}_2\text{CH}_2)$ ), 6.92 (1H, t, H-Ar), 6.97 (1H, d, H-Ar), 6.98 (1H, t, H-Ar), 6.99 (2H, m, H-Ar), 7.20 (1H, t, H-Ar), 7.25 (1H, t, H-Ar), 8.39 (1H, d, H-Ar), 12.91 (1H, s, OH).  $^{13}\text{C}$  NMR (125.7 MHz,  $\text{CDCl}_3$ ):  $\delta\text{C}$  (ppm) 25.9 ( $\text{CH}_2$ ), 49.1 ( $\text{N}(\text{CH}_2\text{CH}_2)$ ), 66.7 ( $\text{O}(\text{CH}_2\text{CH}_2)$ ), 97.4, 117.5, 118.0, 118.2, 119.2, 119.5, 125.0, 128.7, 129.0, 129.6, 133.5, 151.0, 161.0, 162.5, 164.8, 165.5 (aromatic).

2-(4-(piperazin-1-yl)-5H-chromeno[2,3-d]pyrimidin-2-yl)phenol (Entry 3): Yellow powder (79%); m.p: 201–203 °C. IR (KBr,  $\text{cm}^{-1}$ ): 3286, 3064, 2933, 1608.  $^1\text{H}$  NMR (500.1 MHz,  $\text{CDCl}_3$ ):  $\delta\text{H}$  (ppm) 2.5 (1H, m, HN), 3.11 (4H, t,  $\text{N}(\text{CH}_2\text{CH}_2)_2$ ), 3.40 (4H, t,  $\text{N}(\text{CH}_2\text{CH}_2)_2$ ), 3.99 (2H, s,  $\text{CH}_2$ ), 6.89–6.95 (2H, m, H-Ar), 7.10–7.20 (2H, m, H-Ar), 7.25–7.40 (3H, m, H-Ar), 8.26 (1H, d, H-Ar), 13.25 (1H, s, OH).  $^{13}\text{C}$  NMR (125.7 MHz,  $\text{CDCl}_3$ ):  $\delta\text{C}$  (ppm) 26.5 ( $\text{CH}_2$ ), 46.2 ( $\text{N}(\text{CH}_2\text{CH}_2)_2$ ), 53.1 ( $\text{N}(\text{CH}_2\text{CH}_2)_2$ ), 98.1, 117.0, 117.8, 118.5, 119.5, 120.6, 125.0, 128.7, 129.2, 129.6, 133.4, 150.5, 160.5, 161.0, 163.8, 174.0(aromatic).

2-(4-(pyrrolidin-1-yl)-5H-chromeno[2,3-d]pyrimidin-2-yl)phenol (Entry 4): White powder; m.p 185-189 °C: IR (KBr,  $\text{cm}^{-1}$ ): 3435, 2928, 2852, 1555.  $^1\text{H}$  NMR (500.1 MHz,  $\text{CDCl}_3$ ):  $\delta\text{H}$  (ppm) 1.96 (4H, m,  $\text{CH}_2\text{CH}_2$ ), 3.82 (4H, t,  $\text{N}(\text{CH}_2\text{CH}_2)_2$ ), 4.35 (2H, s,  $\text{CH}_2$ ), 6.

88-6.92 (2H, t, H-Ar), 7.10-7.15 (2H, d, H-Ar), 7.22-7.30 (2H, m, H-Ar), 8.28-8.30 (1H, d, H-Ar), 8.33-8.40 (1H, t, H-Ar), 13.50 (1H, s, OH);  $^{13}\text{C}$  NMR (125.7 MHz,  $\text{CDCl}_3$ ):  $\delta\text{C}$  (ppm) 25.7 ( $\text{CH}_2$ ), 26.5 ( $\text{CH}_2\text{CH}_2$ ), 50.6 ( $\text{N}(\text{CH}_2\text{CH}_2)_2$ ), 92.0, 117.7, 118.0, 119.0, 119.2, 119.8, 124.8, 128.6, 129.6, 129.9, 133.0, 151.0, 158.9, 161.0, 162.5, 168.5. (aromatic).

4-Chloro-2-(7-chloro-4-morpholino-5H-chromeno[2,3-d]pyrimidin-2-yl)phenol (Entry 6): White powder (95%); m.p. 246-250 °C; IR (KBr,  $\text{cm}^{-1}$ ): 3435, 2853, 1560, 1249, 1112, 822, 750.  $^1\text{H}$  NMR (500.1 MHz,  $\text{CDCl}_3$ ):  $\delta\text{H}$  (ppm) 3.49 (4H, b,  $\text{N}(\text{CH}_2\text{CH}_2)$ ), 3.77 (2H, t,  $\text{O}(\text{CH}_2\text{CH}_2)$ ), 3.84 (2H, s,  $\text{CH}_2$ ), 3.93 (2H, t,  $\text{O}(\text{CH}_2\text{CH}_2)_2$ ), 6.88 (1H, d, H-Ar), 7.10 (1H, H-Ar), 7.20 (1H, t, H-Ar), 7.22 (1H, d, H-Ar), 7.27 (1H, d, H-Ar), 8.29 (1H, s, H-Ar), 12.98 (1H, s, OH).  $^{13}\text{C}$  NMR (125.7 MHz,  $\text{CDCl}_3$ ):  $\delta\text{C}$  (ppm) 25.5 ( $\text{CH}_2$ ), 48.8 ( $\text{N}(\text{CH}_2\text{CH}_2)$ ), 66.7 ( $\text{O}(\text{CH}_2\text{CH}_2)$ ), 97.7, 118.5, 118.9, 119.3, 119.5, 120.5, 124.0, 128.3, 129.0, 129.5, 133.0, 150.0, 159.0, 161.2, 164.0, 164.7 (aromatic).

4-Chloro-2-(7-chloro-4-(piperazin-4-yl)-5H-chromeno[2,3-d]pyrimidin-2-yl)phenol (Entry 7): Light yellow powder; m.p. 242-245 °C; IR (KBr,  $\text{cm}^{-1}$ ): 3276, 3085, 1657, 1648, 890, 905.  $^1\text{H}$  NMR (500.1 MHz,  $\text{CDCl}_3$ ):  $\delta\text{H}$  (ppm) 2.4 (1H, m, HN), 3.22 (4H, t,  $\text{N}(\text{CH}_2\text{CH}_2)_2$ ), 3.75 (2H, s,  $\text{CH}_2$ ), 3.86 (4H, t,  $\text{N}(\text{CH}_2\text{CH}_2)_2$ ), 6.88 (1H, d, H-Ar), 7.10 (1H, d, H-Ar), 7.18-7.30 (3H, m, H-Ar), 8.26 (1H, d, H-Ar), 13.25 (1H, s, OH).  $^{13}\text{C}$  NMR (125.7 MHz,  $\text{CDCl}_3$ ):  $\delta\text{C}$  (ppm) 25.5 ( $\text{CH}_2$ ), 46.6 ( $\text{N}(\text{CH}_2\text{CH}_2)_2$ ), 53.4 ( $\text{N}(\text{CH}_2\text{CH}_2)_2$ ), 98.3, 118.4, 119.0, 119.5, 120.5, 123.7, 128.1, 128.2, 128.3, 129.5, 132.8, 148.7, 159.0, 161.0, 163.8, 170.1 (aromatic).

4-Chloro-2-(7-chloro-4-(pyrrolidin-1-yl)-5H-chromeno[2,3-d]pyrimidin-2-yl)phenol (Entry 8); m.p. 191-194 °C, Colorless powder (89%). IR (KBr,  $\text{cm}^{-1}$ ): 3435, 2927, 2846, 1555, 740, 903.  $^1\text{H}$  NMR (500.1 MHz,  $\text{CDCl}_3$ ):  $\delta\text{H}$  (ppm) 2.03 (4H, b,  $\text{CH}_2\text{CH}_2$ ), 3.80 (4H, b,  $\text{N}(\text{CH}_2\text{CH}_2)_2$ ), 4.20 (2H, s,  $\text{CH}_2$ ), 6.87 (1H, d, H-Ar), 7.08 (1H, m, H-Ar), 7.13 (1H, m, H-Ar), 7.18 (1H, d, H-Ar), 7.27 (1H, b, H-Ar), 8.32 (1H, b, H-Ar), 13.55 (1H, s, OH).  $^{13}\text{C}$  NMR (125.7 MHz,  $\text{CDCl}_3$ ):  $\delta\text{C}$  (ppm) 25.8 ( $\text{CH}_2$ ), 26.4 ( $\text{CH}_2\text{CH}_2$ ), 50.8 ( $\text{N}(\text{CH}_2\text{CH}_2)_2$ ), 91.9, 118.7, 119.6, 120.0, 121.2, 124.0, 128.9, 129.8, 132.0, 133.0, 145.7, 149.3, 159.7, 160.8, 161.5, 172.0 (aromatic).

2-(4-(dimethylamino)-8-methoxy-5H-chromeno[2,3-d]pyrimidin-2-yl)-5-methoxyphenol (Entry 9): White powder (65%); m.p 190–192 °C. IR (KBr,  $\text{cm}^{-1}$ ): 3422, 3050, 1615, 1251, 1107, 1022.  $^1\text{H}$  NMR (500.1 MHz,  $\text{CDCl}_3$ ):  $\delta\text{H}$  (ppm) 3.25 (6H, s,  $\text{N}(\text{CH}_3)_2$ ), 3.95 (2H, s,  $\text{CH}_2$ ), 3.88 (3H, s,  $\text{OCH}_3$ ), 6.45-6.55 (m, 2H), 6.63 (d, 1H), 6.74 (d, 1H), 7.10 (d, 1H), 8.30 (d, 1H), 13.30 (1H, s, OH).  $^{13}\text{C}$  NMR (125.7 MHz,  $\text{CDCl}_3$ ):  $\delta\text{C}$  (ppm) 34.0 ( $\text{CH}_2$ ), 44.2 ( $\text{N}(\text{CH}_3)_2$ ), 55.1, 55.2 ( $\text{OCH}_3$ ), 94.2, 101.0, 101.8, 106.5, 110.7, 111.0, 112.0, 129, 130.5, 151.0, 159.5, 161.3, 162.0, 163.0, 163.2 (aromatic).

5-Methoxy-2-(8-methoxy-4-morpholino-5H-chromeno[2,3-d]pyrimidin-2-yl)phenol (Entry 10): White powder (75%); m.p. 225-227 °C; IR (KBr,  $\text{cm}^{-1}$ ): 3400, 2849, 1595, 1252, 1110, 1020.  $^1\text{H}$  NMR (500.1 MHz,  $\text{CDCl}_3$ ):  $\delta\text{H}$  (ppm) 3.47 (4H, t,  $\text{N}(\text{CH}_2\text{CH}_2)$ ), 3.80 (3H, s,  $\text{OCH}_3$ ), 3.81 (2H, s,  $\text{CH}_2$ ), 3.82 (3H, s,  $\text{OCH}_3$ ), 3.89 (4H, t,  $\text{O}(\text{CH}_2\text{CH}_2)$ ), 6.50 (2H, m, H-Ar), 6.67 (1H, m, H-Ar), 6.75 (1H, t, H-Ar), 7.10 (1H, d, H-Ar), 8.28 (1H, d, H-Ar), 13.25 (1H, s, OH);  $^{13}\text{C}$  NMR (125.7 MHz,  $\text{CDCl}_3$ ):  $\delta\text{C}$  (ppm) 25 ( $\text{CH}_2$ ), 48.5 ( $\text{N}(\text{CH}_2\text{CH}_2)$ ), 55.2, 55.6 ( $\text{OCH}_3$ ), 66.4 ( $\text{O}(\text{CH}_2\text{CH}_2)$ ), 97.0, 101.5, 102.0, 106.7, 111.0, 111.3, 112.0, 129.0, 130.6, 151.0, 155.7, 159.5, 161.8, 162.1, 163.6, 164.8 (aromatic).

## 2) $^1\text{H}$ NMR and $^{13}\text{C}$ NMR spectra of products





















