

Supporting information for

**On-water synthesis of phenols using biogenic Cu₂O
nanoparticles without using H₂O₂**

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1. Recyclability of the catalyst:

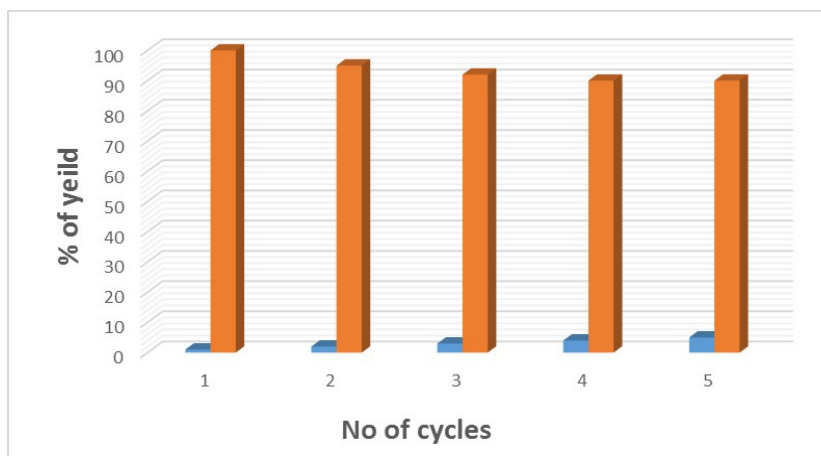


Figure S1. Recyclability of the catalyst

Characterization of the products:

Phenol (Entry 1): Brown liquid, $^1\text{H-NMR}$ (400 MHz, CDCl_3): δ 7.18- 7.30 (m, 2H), 6.94-6.78 (m, 3H), 5.30 (s, br, 1H) ppm; $^{13}\text{C-NMR}$ (100 MHz, CDCl_3): δ 155.4, 129.5, 120.6, 115.2 ppm; $m/z = 94.042$; elemental Anal: C, 76.57; H, 6.43; O, 17.00.

4-Methoxyphenol (Entry 2): White gum, m.p. 56 °C; $^1\text{H-NMR}$ (400 MHz, CDCl_3): δ 6.84-6.74 (m, 4H), 4.62 (s, br, 1H), 3.81 (s, 3H) ppm; $^{13}\text{C-NMR}$ (100 MHz, CDCl_3): δ 155.5, 152.5, 116.1, 115.5, 55.5 ppm; $m/z = 124.052$; elemental Anal.: C, 67.73; H, 6.50, O, 25.78.

4-Nitrophenol (Entry 3): Yellow solid, m.p. 112; °C $^1\text{H-NMR}$ (400 MHz, CDCl_3): δ 8.21 (d, 2H), 6.98 (d, 2H), 6.57 (s, br, 1H) ppm; $^{13}\text{C-NMR}$ (100 MHz, CDCl_3): δ 161.7, 141.3, 126.3, 115.8 ppm; $m/z = 139.027$; elemental Anal: C, 51.80; H, 3.62; N, 10.07; O, 34.50.

2-methylphenol (Entry 4) Brown liquid, $^1\text{H-NMR}$ (400 MHz, CDCl_3): δ 7.13-7.06 (m, 2H), 6.84 (t, 1H), 6.77 (d, 1H), 6.12 (s, br, 1H), 2.35 (s, 3H) ppm; $^{13}\text{C-NMR}$ (100 MHz, CDCl_3): δ 154.5, 130.2, 127.3, 124.9, 121.3, 115.7, 14.9 ppm. $m/z = 108.058$; elemental Anal: C, 77.75; H, 7.46; O, 14.80.

3-Methoxyphenol (Entry 5): Colorless oil, $^1\text{H-NMR}$ (400 MHz, CDCl_3): δ 7.13 (t, 1H), 6.50-6.41 (m, 3H), 5.34 (s, 1H), 3.77 (s, 3H) ppm; $^{13}\text{C-NMR}$ (100 MHz, CDCl_3): δ 161.2, 155.6, 131.5, 105.2, 104.5, 102.2, 55.3 ppm; $m/z = 124.052$; elemental Anal: C, 67.73; H, 6.50; O, 25.78.

4-Chlorophenol (Entry 6): White gum, $^1\text{H-NMR}$ (400 MHz, CDCl_3): δ 7.19 (d, 2H), 6.77 (d, 2H), 4.87 (s, br, 1H) ppm; $^{13}\text{C-NMR}$ (100 MHz, CDCl_3): δ 154.2, 129.4, 125.5, 116.6 ppm; $m/z = 128.003$; elemental Anal: C, 56.06; H, 3.92; Cl, 27.58; O, 12.45.

4-Methylphenol (Entry 7): Colourless gum, $^1\text{H NMR}$ (400 MHz, CDCl_3): δ 7.03 (d, 2H), 6.75 (d, 2H), 4.17 (s, br, 1H), 2.25 (s, 3H); $^{13}\text{C NMR}$ (100 MHz, CDCl_3): δ 155.7, 132.2, 130.3, 116.3, 21.4 ppm; $m/z = 108.058$; elemental Anal: C, 77.75; H, 7.46; O, 14.80.

Thiophen-2-ol (Entry 8): Colorless oil, $^1\text{H NMR}$ (400 MHz, CDCl_3): δ 7.73 (t, 1H), 7.55-7.53 (m, 2H), 5.46 (s, br, 1H) ppm; $^{13}\text{C-NMR}$ (100 MHz, CDCl_3): 165.2, 131.6, 128.2, 111.2 ppm; $m/z = 99.998$; elemental Anal: C, 47.98; H, 4.03; O, 15.98; S, 32.02

4-Hydroxyacetophenone (Entry 9): Powder, m.p. 110 °C; ¹H-NMR (400 MHz, *CDCl*₃): δ 7.92(d, 2H), 6.93 (d, 2H), 5.55 (s, br, 1H), 2.56 (s, 3H) ppm; ¹³C-NMR (100 MHz, *CDCl*₃): δ 197.5, 161.2, 130.9, 129.5, 115.3, 26.1 ppm. m/z = 136.056; elemental Anal: C, 70.57; H, 5.92; O, 23.50.

3-Methylphenol (Entry 10): Colourless gum, ¹H-NMR (400 MHz, *CDCl*₃): δ 7.13 (t, 1H), 6.75-6.62 (m, 3H), 4.98 (s, br, 1H), 2.25 (s, 3H) ppm; ¹³C-NMR (100 MHz, *CDCl*₃): δ 154.3, 139.2, 129.5, 122.6, 115.3, 112.4, 20.9 ppm; m/z = 108.058; elemental Anal: C, 77.75; H, 7.46; O, 14.80

3-Nitrophenol (Entry 11): Yellow Solid, m.p. 98 °C; ¹H-NMR (400 MHz, *CDCl*₃): δ 7.81 (d, 1H), 7.70 (s, 1H), 7.41 (d, 1H), 7.18 (d, 1H) 5.59 (s, br, 1H) ppm; ¹³C-NMR (100 MHz, *CDCl*₃): δ 158.2, 149.6, 135.2, 121.2, 115.6, 110.2 ppm. m/z = 139.027; elemental Anal: C, 51.80; H, 3.62; N, 10.07; O, 34.50.

Furan-2-ol (Entry 12): Colorless oil, ¹H NMR (400 MHz, *CDCl*₃): δ 7.72 (t, 1H), 7.12-6.67 (m, 2H), 5.57 (s, br, 1H) ppm; ¹³C-NMR (100 MHz, *CDCl*₃): 145.3, 141.2, 117.3, 116.2 ppm; m/z = 84.021; elemental Anal: C, 57.14; H, 4.80; O, 38.06

