

Electronic Supplementary Information

Ag-grafted covalent imine network material for one-pot three-component coupling and hydration of nitriles to amides in aqueous medium

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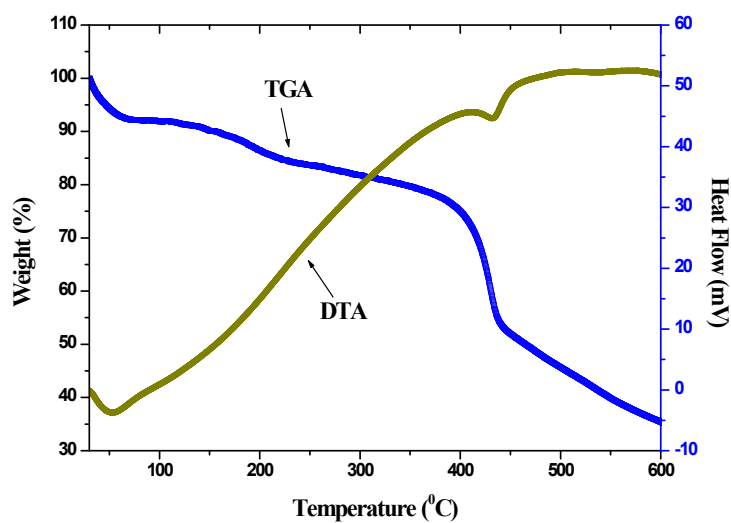


Figure S1: TGA (a) and DTA (b) profiles of Ag-CIN-1 material

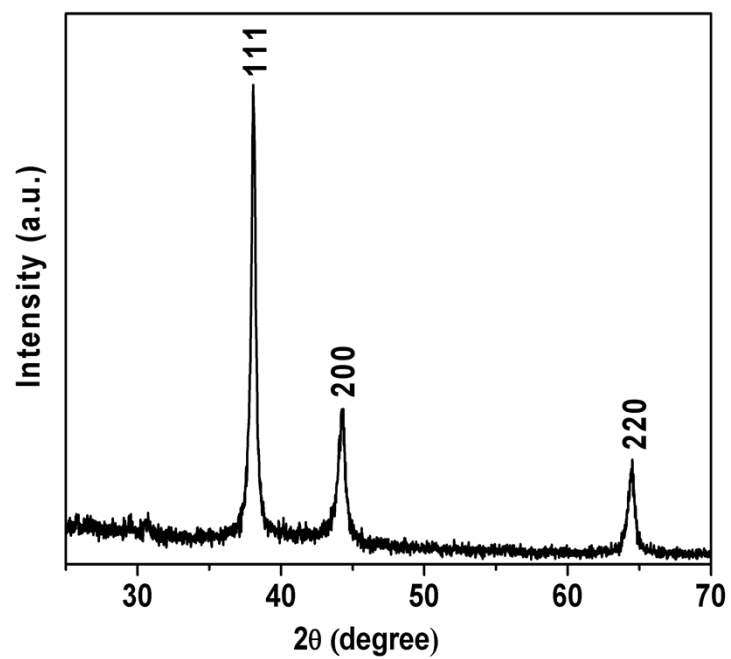
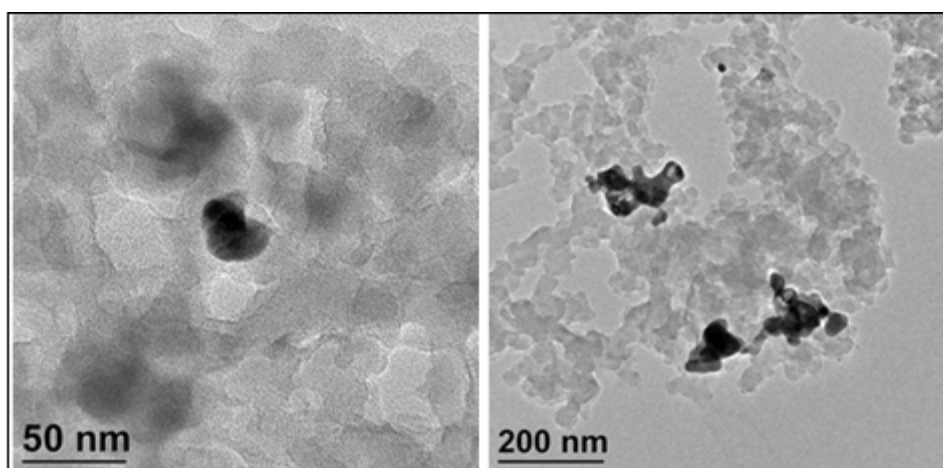


Figure
XRD
Reused
CIN-1
catalyst



S2:
Ag-

Figure S3: TEM Reused Ag-CIN-1 catalyst

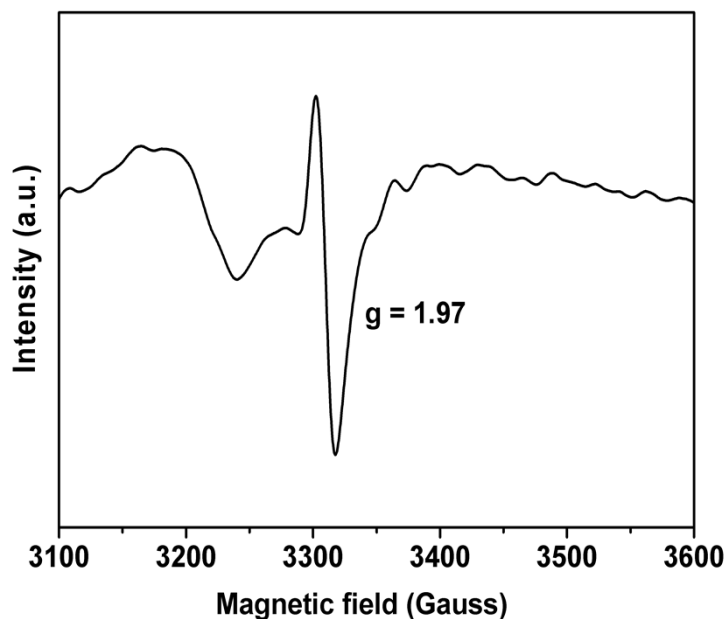


Figure S4: TEM Reused Ag-CIN-1 catalyst

Spectral data of the isolated product:

The three-component (A^3) coupling reaction:

1-(1,3-Diphenylprop-2-ynyl)pyrrolidine¹ (Entry1)

¹H NMR (CDCl₃, 500MHz, ppm): δ = 1.84 (s, 4H), 2.73 (s, 4H), 4.92 (s, 1H), 7.30–7.38 (m, 4H), 7.43 (t, 2H), 7.51–7.50 (m, 2H), 7.62–7.65 (m, 2H).

1-(1-(4-Methoxyphenyl)-3-phenylprop-2-ynyl) pyrrolidine¹ (Entry2)

¹H NMR (CDCl₃, 500MHz, ppm): δ = 1.82 (m, 4H), 2.73 (m, 4H), 3.81 (s, 3H), 4.82 (s, 1H), 6.93 (d, 2H), 7.33 (m, 3H), 7.50–7.51 (m, 2H), 7.50–7.52 (m, 2H).

N-[1-(4-Methylphenyl)-3-phenyl-2-propynyl]piperidine² (Entry3)

¹H-NMR (CDCl₃, 400MHz, ppm) δ =7.61–7.54(m, 4H), 7.40–7.34(m, 3H), 7.21(d, 2H), 4.81(s, 1H), 2.65–2.56(m, 4H), 2.40 (s, 3H), 1.73–1.55(m, 4H), 1.58–1.43(m, 2H)

N-[1-(4-Ethylphenyl)-3-phenyl-2-propynyl]piperidine² (Entry4)

¹H-NMR (CDCl₃, 400MHz, ppm) δ =7.53–7.46(m, 4H), 7.35–7.26(m, 3H), 7.18(d, 2H), 4.76(s, 1H), 2.62(q, 2H), 2.60–2.47(m, 4H), 1.64–1.50(m, 4H), 1.50–1.35(m, 2H), 1.23(t, 3H)

1-(1-(4-Chlorophenyl)-3-phenylprop-2-ynyl) pyrrolidine¹ (Entry5)

¹H NMR (CDCl₃, 500MHz, ppm): δ = 1.80(m, 4H), 2.71 (m, 4H), 4.93 (s, 1H), 7.34–7.35 (m, 5H), 7.50–7.51 (m, 2H), 7.55–7.63 (m, 2H).

N-[1-(4-Bromophenyl)-3-phenyl-2-propynyl]piperidine² (Entry6)

¹H-NMR (CDCl₃, 400MHz, ppm) δ=7.61-7.57(m, 4H), 7.52-7.53(m, 2H), 7.40-7.36(m, 3H), 4.81(s, 1H), 2.65-2.55(m, 4H), 1.73-1.59(m, 4H), 1.58-1.45(m, 2H);

N-(3-Phenyl)-prop-2-ynyl piperidine³ (Entry7)

¹H-NMR (CDCl₃, 400MHz, ppm): δ= 7.43-7.40 (m, 2H), 7.33-7.28 (m, 3H), 3.45 (s, 2H), 2.56 (br, 4H), 1.69-1.61 (m, 4H), 1.45 (br, 2H).

N-(1-Isopropyl-3-phenyl-2-propynyl) piperidine³ (Entry8)

¹H-NMR (CDCl₃, 400MHz, ppm): δ= 7.45–7.44 (m, 2H), 7.34–7.32 (m, 3H), 3.03 (d, 1H), 2.69–2.64 (m, 2H), 2.43 (br, 2H), 1.97-1.90 (m, 1H), 1.65–1.58 (m, 4H), 1.49–1.47 (m, 2H), 1.10 (d, 3H), 1.01 (d, 3H).

4-(3-Phenyl-1-piperidin-1-yl-prop-2-ynyl)-pyridine⁴ (Entry10)

¹H NMR (300 MHz, CDCl₃, ppm): δ= 0.83– 0.89 (m, 2H), 1.37–1.48 (m, 4H), 2.45–2.50 (m, 4H), 4.75 (s, 1H), 7.28–7.32 (m, 5H), 7.49 (d, 2H), 7.64 (d, 2H)

1-(1-Phenyl-3-p-tolyl-prop-2-ynyl)-piperidine⁴ (Entry12)

¹H NMR (300 MHz, CDCl₃ ppm): δ= 1.40–1.61 (m, 2H), 1.55–1.62 (m, 4H), 2.50–2.57 (m, 4H), 2.37 (s, 3H), 4.75 (s, 1H), 7.1 (d, 2H), 7.22–7.40 (m, 5H), 7.60 (d, 2H).

4-(1, 3 diphenylprop-2-ynyl) morpholine⁵ (Entry14)

¹H NMR (300 MHz, CDCl₃, ppm): δ= 7.64-7.57 (m, 2H), 7.55-7.40 (m, 3H), 7.40-7.21 (m, 5H), 4.77 (s, 1H), 3.81-3.64 (m, 4H), 2.70-2.52 (m, 4H).

1-(1,3-diphenylprop-2-ynyl)pyrrolidine⁶ (Entry15)

¹H NMR (300 MHz, CDCl₃ ppm): δ= 7.61–7.57 (m, 2H), 7.51–7.45 (m, 2H), 7.34–7.28 (m, 6H), 4.88(s, 1H), 2.70–2.65 (m, 4H), 1.80–1.75(m, 4H).

N-[1-(Furfuryl)-3-phenyl-2-propynyl]piperidine⁷ (Entry16)

¹H NMR (100 MHz, CDCl₃ ppm): δ= 7.34-7.60 (m, 8H), 4.75 (s, 3H), 2.63-2.75 (m, 4H), 1.43-1.78 (m, 6H).

(1,3-Diphenyl-prop-2-ynyl)diethylamine (Entry 17)

¹H NMR (300 MHz, CDCl₃, ppm): δ 0.97-1.04 (m, 6H), δ 2.40-2.62 (m, 4H), δ 4.97 (s, 1H), δ 7.24-7.27 (m, 5H), δ 7.41-7.44 (m, 3H), δ 7.59-7.61 (m, 2H).

Table 2, Entry 1

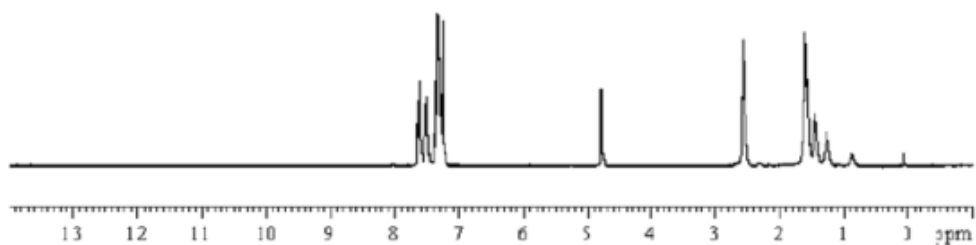


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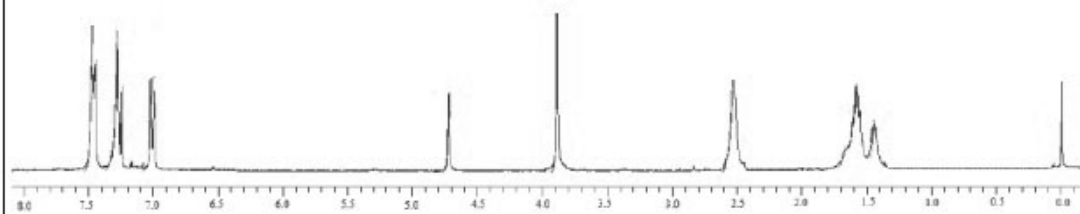


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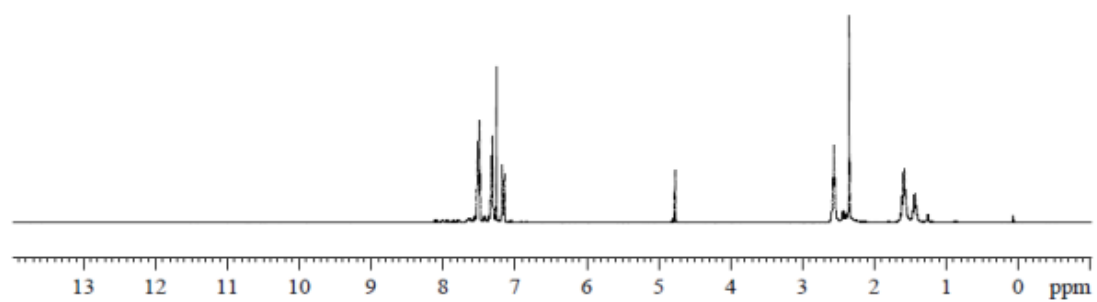


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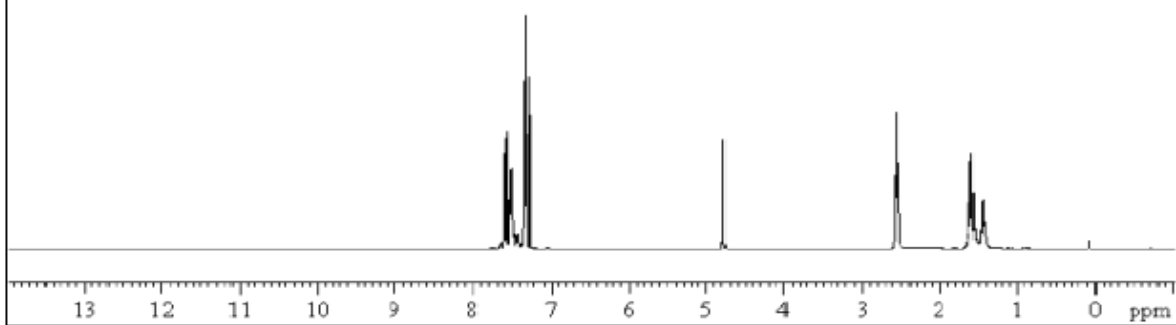


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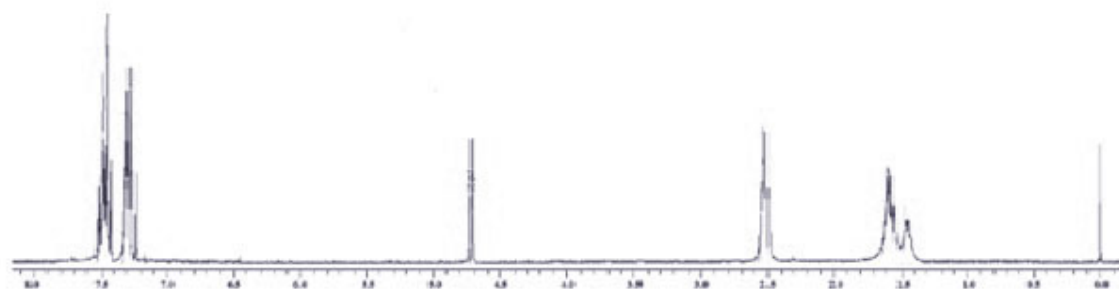


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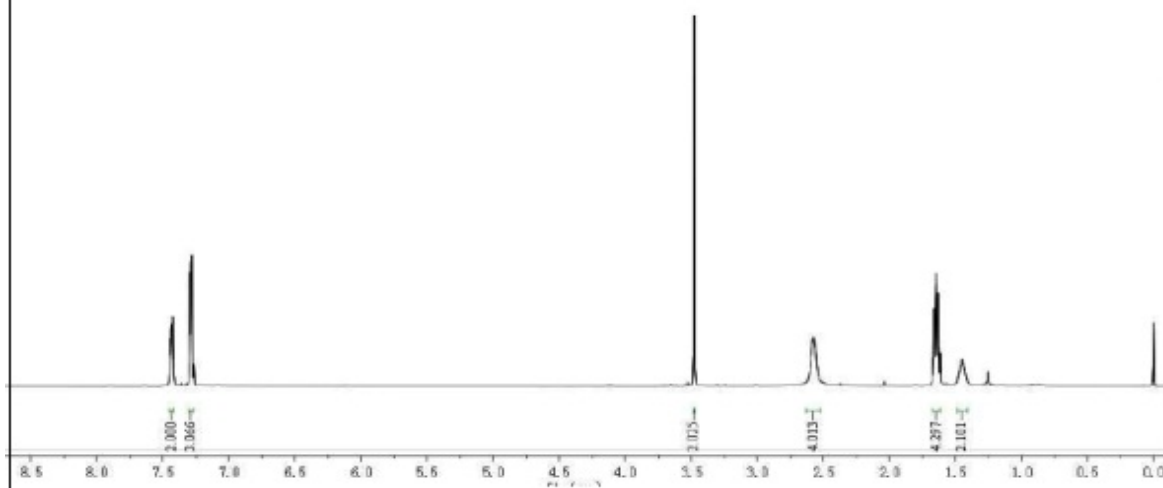


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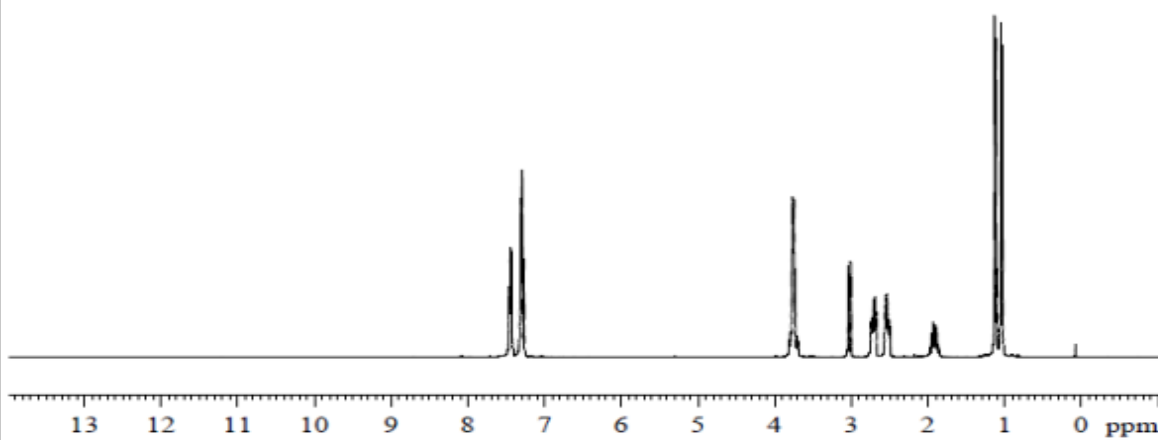


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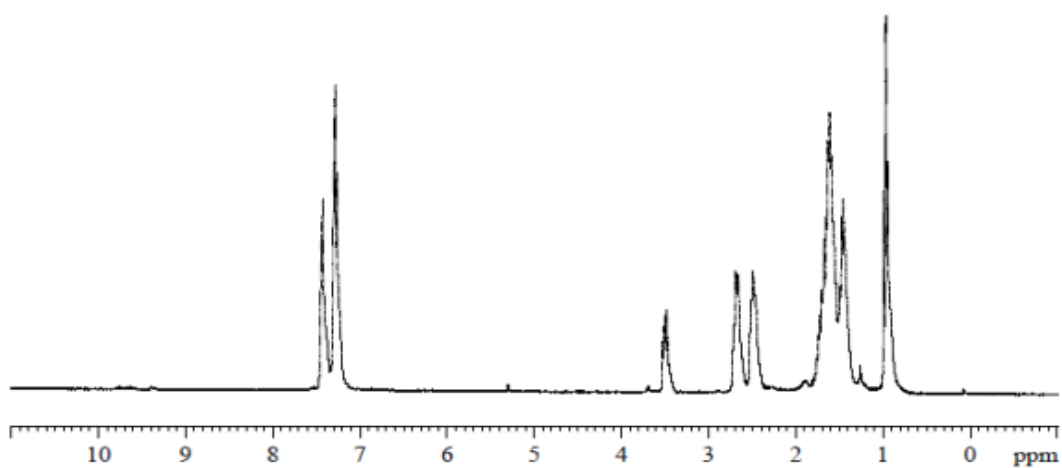


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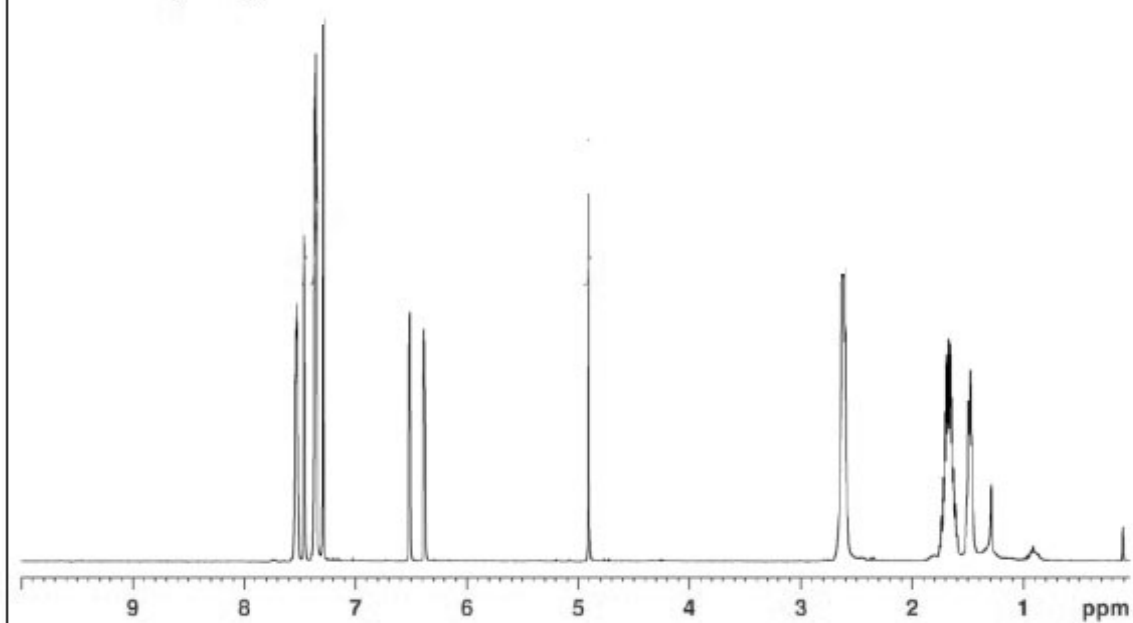


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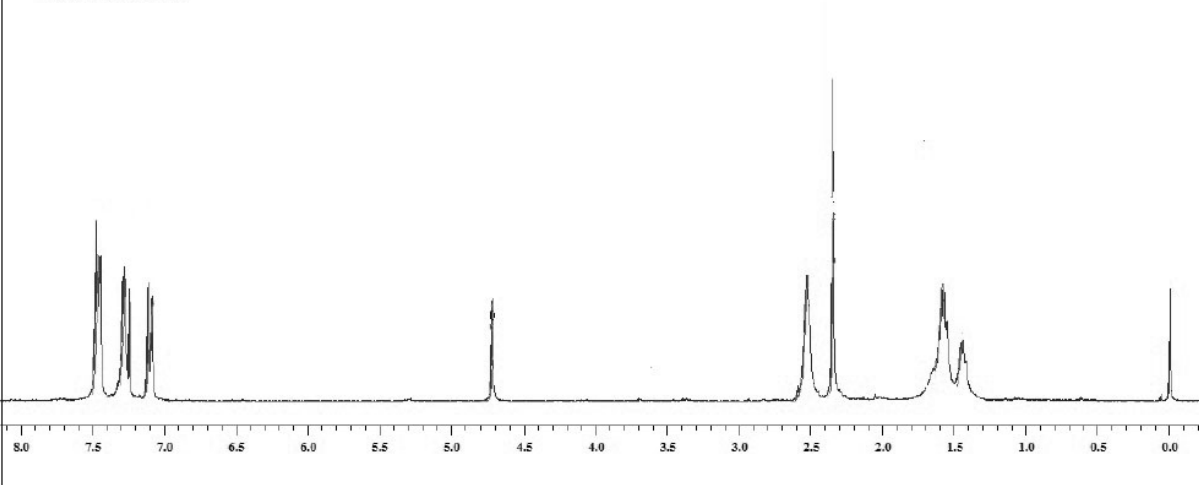


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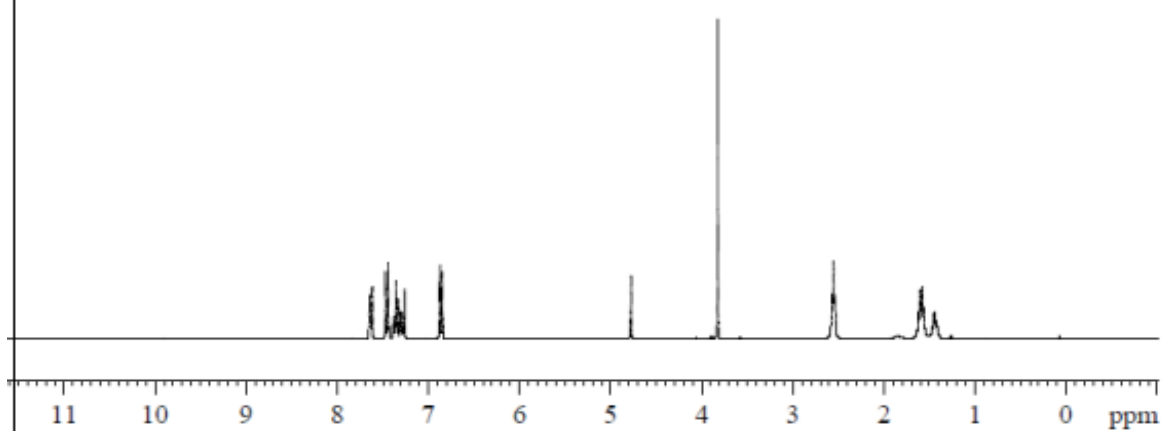


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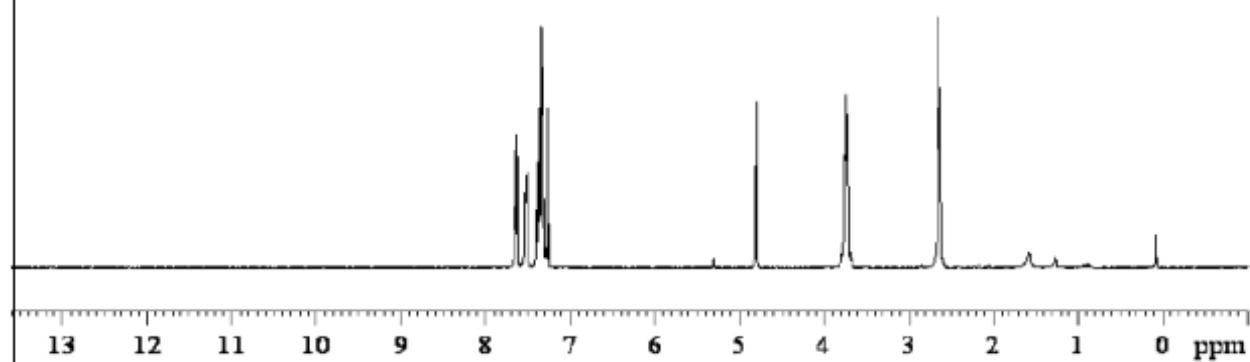


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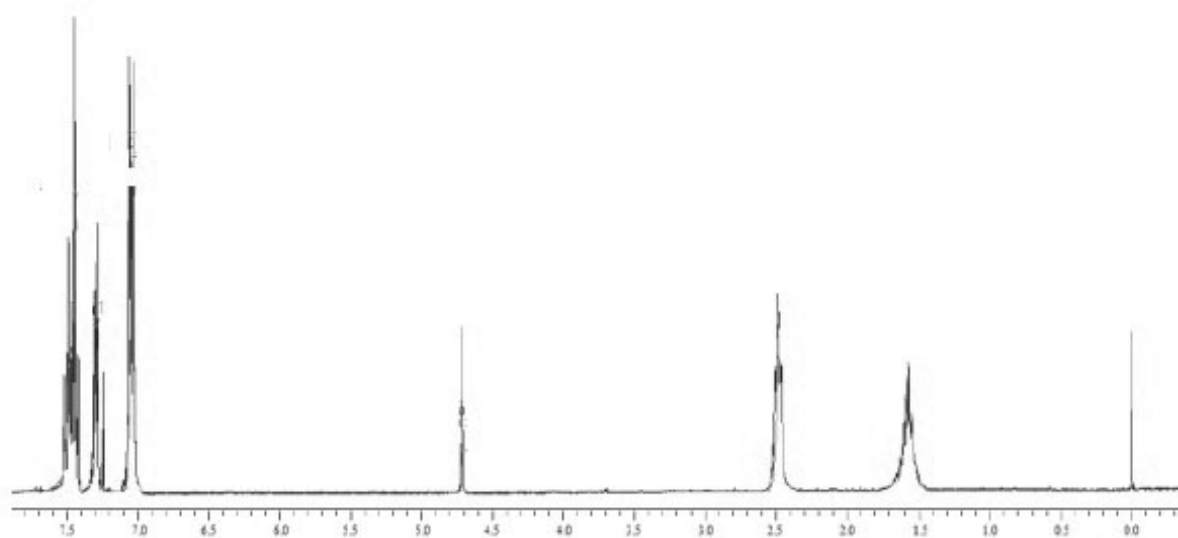


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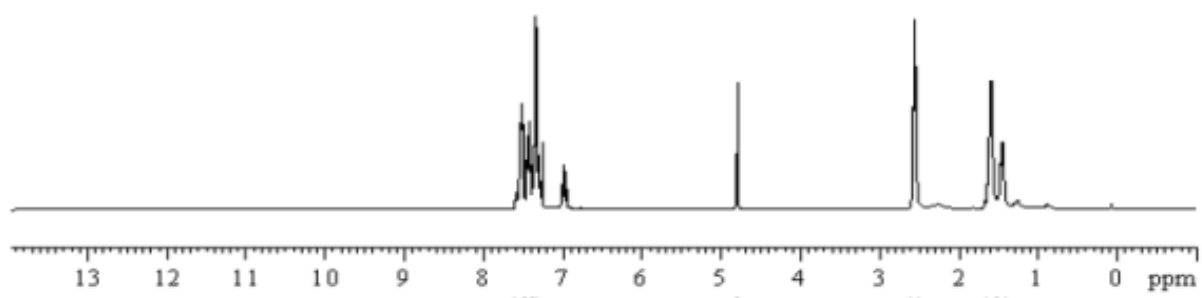
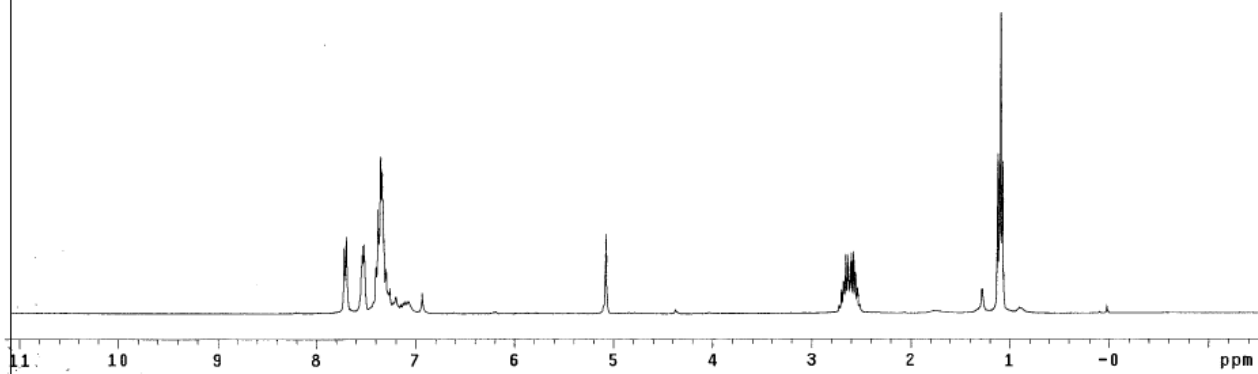


Table 2, Entry 17



Reference

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