Facile Fabrication of Magnetically Recyclable Metal-Organic Framework Nanocomposites for Highly Efficient and Selective Catalytic Oxidation of Benzylic C–H Bonds


**Oxidation of Benzylic C–H Bonds with HKUST-1@Fe₃O₄**

**Preparation of HKUST-1@Fe₃O₄:**

\[ \text{HKUST-1@Fe₃O₄} \]

\[ \text{Cu(OAc)₂-H₂O} \]

\[ \text{BTC} \]

\[ \text{Fe₃O₄-CO₂H} \]

**Oxidation of benzylic hydrocarbons:**

\[ \text{HKUST-1@Fe₃O₄} \ (25 \text{ mg}) \]

TBHP (2.5 mol equiv), benzonitrile (0.5 mL)

80 °C, 14 h

94.7% conversion
95.2% selectivity

99% conversion
99% selectivity

99% conversion
99% selectivity

98.3% selectivity

97.1% selectivity

**Significance:** The magnetic core–shell nanocomposites HKUST-1@Fe₃O₄ were prepared from Fe₃O₄-CO₂H (Φ 20 nm), polyvinylpyrrolidone (PVP), Cu(OAc)₂, and trimesic acid (BTC), in which the iron-based nanoparticles were encapsulated by the resulting HKUST-1 shell [for the copper-organic framework of Cu(OAc)₂ and trimesic acid, see: Chui et al. Science 1999, 283, 1148]. The oxidation of benzylic C–H bonds was carried out with HKUST-1@Fe₃O₄ and TBHP to give the corresponding desired carbonyl products in up to >99% conversion and >99% selectivity.

**Comment:** The catalyst was characterized by SEM, HR-TEM, PXRD, BET, and FT-IR analyses. Elemental analysis revealed a ratio of copper and iron of 19.34% and 28.63%. The catalyst was recovered by an external magnet and reused twice without significant loss of the catalytic activity.