Cobalt-Impregnated Magnetite as General Heterogeneous Catalyst for the Hydroacylation Reaction of Azodicarboxylates


Hydroacylation of Azodicarboxylates with Aldehydes Using CoO–Fe₃O₄

**Significance:** Magnetite-supported cobalt oxide (CoO–Fe₃O₄) was prepared by mixing CoCl₂·6H₂O and Fe₃O₄ in water followed by treatment with NaOH (eq. 1). CoO–Fe₃O₄ catalyzed the hydroacylation of azodicarboxylates 1 with aldehydes 2 in trichloroethylene to afford the hydroacylated products 3 in up to 99% yield (eq. 2).

**Comment:** In the formation of 3a, the catalyst was recovered by magnetic separation and reused nine times with slight loss of its catalytic activity. The catalytic activity of CoO–Fe₃O₄ was superior to that of the other metal oxides supported on Fe₃O₄ (NiO–Fe₃O₄, CuO–Fe₃O₄, Ru₂O₃–Fe₃O₄, Rh₂O₃–Fe₃O₄, PdO–Fe₃O₄, Ag₂O/Au–Fe₃O₄, WOₓ–Fe₃O₄, OsO–Fe₃O₄, Pto/PtO₂–Fe₃O₄, Au₂O₃/Au–Fe₃O₄, NiO/Cu–Fe₃O₄, PdO/Cu–Fe₃O₄) and unsupported CoO.

CoCl₂·6H₂O → Fe₃O₄ → NaOH → 100 °C, 24 h → CoO–Fe₃O₄ (1)

1 + 2 → CoO–Fe₃O₄ (1.42 mol%) → trichloroethylene → 60 °C, 3 h → 3

Selected examples:

- 3a 89% yield
- 3b 86% yield
- 3c 67% yield
- 3d 95% yield
- 3e 87% yield
- 3f 74% yield
- 3g 99% yield
- 3h 99% yield