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


### 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/Ag–Fe₃O₄, WOₓ–Fe₃O₄, OsO–Fe₃O₄, PtO/PtO₂–Fe₃O₄, Au₂O₃/Au–Fe₃O₄, NiO/Cu–Fe₃O₄, PdO/Cu–Fe₃O₄) and unsupported CoO.

### Key words:
cobalt oxide
magnetite
hydroacylation
azodicarboxylates

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**Hydroacylation of Azodicarboxylates with Aldehydes Using CoO–Fe₃O₄**

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\text{CoCl}_2 \cdot 6\text{H}_2\text{O} + \text{Fe}_3\text{O}_4 + \text{H}_2\text{O} \xrightarrow{\text{NaOH, 100 °C, 24 h}} \text{CoO–Fe}_3\text{O}_4 \tag{1}
\]

\[
\text{R}^1\text{O} - \text{N} = \text{N} - \text{OR}^1 + \text{R}^2\text{H} \xrightarrow{\text{CoO–Fe}_3\text{O}_4 (1.42 \text{ mol} \%)} \text{R}^1\text{O} - \text{N} = \text{N} - \text{OR}^1 + \text{R}^2\text{H} \xrightarrow{\text{trichloroethylene, 60 °C, 3 h}} \text{产物3} \tag{2}
\]

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

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