**Heterogenized Cobalt Oxide Catalysts for Nitroarene Reduction by Pyrolysis of Molecularly Defined Complexes**


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### Co$_3$O$_4$–Nitrogen Complex for Hydrogenation of Nitroarenes

**Preparation of a carbon-supported cobalt oxide nitrogen catalyst 1:**

- **N**
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  - **Co(OAc)$_2$·4H$_2$O**
  - **EtOH, r.t., 30 min**
  - **Vulcan XC72R, 60 °C, 4 h**
  - **800 °C, 2 h**

**Catalyst 1 (1 mol%)**

- H$_2$ (50 bar), THF–H$_2$O, 110 °C

**Results:**

- **2a:** 4 h, 91% yield
- **2b:** 4 h, 99% yield
- **2c:** 4 h, 99% yield
- **2d:** 6 h, 97% yield
- **2e:** 6 h, 94% yield
- **2f:** 6 h, 93% yield
- **2g:** 12 h, 96% yield
- **2h:** 4 h, 99% yield
- **2i:** 6 h, 96% yield
- **2j:** 4 h, 97% yield

**Significance:** A carbon-supported cobalt oxide-nitrogen catalyst 1 was prepared by pyrolysis (800 °C) of Co(phen)$_2$(OAc)$_2$ on Vulcan XC72R (an activated carbon). The hydrogenation of nitroarenes was carried out with 1 (1 mol% copper) in THF–H$_2$O under 50 bar of H$_2$ to give the corresponding anilines 2a–j in up to 99% yield.

**Comment:** The catalyst was reused nine times in the reaction of nitrobenzene where catalytic activity gradually decreased. The catalyst was characterized with TEM, energy-dispersive X-ray (EDX), XPS, and electron paramagnetic resonance (EPR).

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