Zeolitic Imidazole Framework Encapsulated Copper Nanoparticles for Hydrogenation of Aldehydes

**Significance:** Copper nanoparticles encapsulated in a zeolitic imidazole framework (CuNPs@ZIF-8), prepared as shown in equation 1, catalyzed the hydrogenation of aromatic aldehydes with hydrogen gas to give the corresponding alcohols in yields of 94–99% (eq. 2; 8 examples).

**Comment:** The CuNPs@ZIF-8 catalyst was characterized by means of XRD, XPS, AES, TEM, and HR-TEM analyses. In the hydrogenation of 5-(hydroxymethyl)furfural, the catalyst was recovered and reused four times without loss of its catalytic activity.

**Equations:**

1. 
\[
\text{Zn(NO}_3\text{)}_2 \cdot 6\text{H}_2\text{O} + \text{CuCl}_2 \cdot \text{H}_2\text{O} \xrightarrow{\text{MeOH, r.t., 12 h}} \text{ZIF-8} + \text{CuCl}_2 \cdot \text{H}_2\text{O} \xrightarrow{\text{NaBH}_4, \text{r.t., 1 h}} \text{CuNPs@ZIF-8} \]

2. 
\[
\text{ArCHO} \xrightarrow{\text{CuNPs@ZIF-8 (7.2 mol% Cu), 140 °C, H}_2 (2 \text{ MPa}, 3 \text{ h})} \text{ArCH}_2\text{OH} \]

**Results:**

- 99% yield
- 99% yield
- 99% yield
- 99% yield
- 94% yield
- 97% yield
- 98% yield
- 99% yield

[Image of chemical structures]

**Keywords:** copper catalysis, hydrogenation, aldehydes, alcohols, nanoparticles.