Polymer-Supported Iron(III) Catalyst for the Selective Oxidation of Toluene

**Significance:** Poly(4-vinylpyridine-co-divinylbenzene)-supported iron(III) catalysts bearing different amounts (2–50%) of DVB cross-linker [Fe(III)-PVPDVB2–50%] were prepared and applied to the oxidation of toluene with hydrogen peroxide (73.0–89.7% conversion, 88.3–91.2% selectivity to benzoic acid). The polymer-supported catalyst containing 10% DVB [Fe(III)-PVPDVB10%] led to the selective oxidation of toluene to benzoic acid in 90% conversion with up to 96% selectivity under optimized conditions.

**Comment:** The catalytic activity of reused Fe(III)-PVPDVB10% decreased due to leaching of iron ions from the polymer support. No oxidation of toluene occurred in the absence of the polymer-supported iron catalysts or in the presence of iron-free PVPDVB. The toluene oxidation with the homogeneous counterpart, FeCl3·H2O, resulted in lower substrate conversion (<58%), while the reaction selectivity was as high as with the polymer catalyst (92%).

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**N**

1,4-divinylbenzene (**DVB**) (2–50%)

4-vinylpyridine (**4-VP**) (4-VP)

85 °C, 16 h

poly(4-vinylpyridine-co-divinylbenzene) (**PVPDVB**)

**FeCl3·H2O/MeOH**

reflux, 16 h

Fe(III)-PVPDVB2–50%

**35% H2O2 (13.7 mmol)**

**Fe-PVPDVB2–50% (10 mg)**

**MeCN (4 mL), 80 °C, 6 h**

Fe(III)-PVPDVB2%

73.0% conv., 91.0% selectivity to benzoic acid

Fe(III)-PVPDVB6%

78.8% conv., 90.2% selectivity to benzoic acid

Fe(III)-PVPDVB10%

89.7% conv., 91.2% selectivity to benzoic acid

Fe(III)-PVPDVB25%

77.0% conv., 89.3% selectivity to benzoic acid

Fe(III)-PVPDVB50%

77.9% conv., 88.3% selectivity to benzoic acid