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In situ pyrolysis of Ce-MOF to prepare CeO_2 catalyst with obviously improved catalytic performance for toluene combustion

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ABSTRACT

Mesoporous CeO_2 catalysts (CeO_2-MOF) were synthesized by pyrolysis of Ce-MOF precursor (Ce-(1,3,5-benzenetricarboxylic acid) $(H_2O)_6$). Physicochemical properties of the samples were investigated by means of various techniques including XRD, SEM, TEM, BET, Raman, XPS, H_2-TPR, O_2-TPD and NH_3-TPD, and their catalytic performance were evaluated by toluene combustion compared with commercial CeO_2 (CeO_2-C) and CeO_2 prepared by precipitation method (CeO_2-P). The results show that CeO_2-MOF/350 catalyst (pyrolyzed at 350 ^oC) presents enhanced catalytic activity for toluene oxidation with the conversion of $T_{10\%}$, $T_{50\%}$ and $T_{90\%}$ at 180, 211, and 223 ^oC, respectively (SV = 20000 mL/(g h), toluene concentration = 1000 ppm). Especially for high-temperature region, CeO_2-MOF/350 catalyst displays much superior ability to