

Novel Mn–Cu-Containing CeO₂ Nanopolyhedra for the Oxidation of CO and Diesel Soot: Effect of Dopants on the Nanostructure and Catalytic Activity

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Abstract

Ceria-based catalysts doped with manganese and copper were obtained via the hydrothermal synthesis. Four systems were synthesized: CeO₂ (pure ceria), Ce_{0.95}Mn_{0.05} (Mn/Ce at. ratio = 1/19), Ce_{0.95}Cu_{0.05} (Cu/Ce at. ratio = 1/19) and Ce_{0.95}Mn_{0.025}Cu_{0.025} (Mn/Cu/Ce at. ratio = 1/1/38). The catalytic activity of the prepared materials was tested for the CO and soot oxidations. Complementary techniques (XRD, N₂ physisorption at – 196 °C, FESEM, XPS, Raman spectroscopy, CO-TPR and Soot-TPR) were performed to investigate their physico-chemical properties. The samples were characterized by nanocubes, in the case of CeO₂, and by nanopolyhedra for binary (Ce_{0.95}Mn_{0.05} and Ce_{0.95}Cu_{0.05}) and ternary oxides (Ce_{0.95}Mn_{0.025}Cu_{0.025}). The CO-TPR analysis has confirmed that the reducibility follows the order: CeO₂ < Ce_{0.95}Mn_{0.05} < Ce_{0.95}Mn_{0.025}Cu_{0.025} ...