

Pure and Fe-doped CeO₂ nanoparticles obtained by microwave assisted combustion synthesis: Physico-chemical properties ruling their catalytic activity towards CO oxidation and ...

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Description

A sample of pure CeO₂ and two samples of Fe-doped CeO₂ containing either 3 or 6 at.% Fe were obtained by microwave assisted combustion synthesis. The powders were extensively characterized by several techniques and tested as catalysts for both CO oxidation and soot combustion.

As-synthesized CeO₂ nanoparticles have a mostly squared shape and size well below 100 nm; they are characterized by the presence of surface Ce³⁺ species likely due to the occurrence of very defective ceria crystalline phases, as revealed by HR-TEM. Oxidation at 400 °C leads to the formation of a hydroxyls-rich surface, with several types of OH groups related to both Ce⁴⁺ and Ce³⁺ species; reduction in H₂ at mild temperature (200 °C) leads both to reduction of surface Ce⁴⁺ to Ce³⁺ and formation of new OH groups.

With respect to CeO₂ nanoparticles, Fe-doped ones have, as a whole, a larger size and less abundant ...