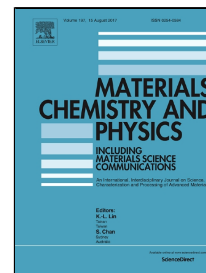


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Facile synthesis of ordered CeO₂ nanorod assemblies: morphology and reactivity

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Abstract

A two-step hydrothermal synthesis of nanostructured CeO₂ assemblies is reported. The main benefit of the presented approach is the usage of simple reagents and standard laboratory equipment which allows obtaining novel CeO₂ morphology. The CeO₂ nanostructured materials are characterised with respect to their surface (N₂-BET, XPS), bulk (XRD, Raman) and microscopic characteristics (HRTEM, EELS). The effect of calcination temperature of the hydrothermally obtained precursor on the crystallinity of final products is reported. Since ceria is very often used in catalytic applications as an active phase or as a support, the catalytic total oxidation of methane was used as a model reactivity test. The physicochemical characterization and reactivity results are compared with CeO₂ materials obtained via simple precipitation method. The materials obtained with the presented facile hydrothermal method are characterised by a unique ordered nanorod morphology and present catalytic activity in total methane oxidation improved with respect to classical synthesis protocols. The surface of the nanorod-type assemblies was found to be enriched with Ce³⁺, especially when calcined at a lower temperatures. Due to the availability of the active centres within the obtained nanocrystalline rod-type assemblies and exposition of reduced surface, they can be interesting in catalytic applications as support with the active phase confined in their structure.

Keywords

synthesis, CeO₂, methane oxidation, ceria, support, catalyst

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