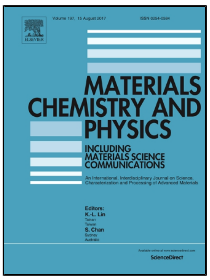
Accepted Manuscript



Facile synthesis of ordered CeO_2 nanorod assemblies: morphology and reactivity

Paweł Stelmachowski, Klaudia Ciura, Paulina Indyka, Andrzej Kotarba

PII:	S0254-0584(17)30654-5
DOI:	10.1016/j.matchemphys.2017.08.038
Reference:	MAC 19936
To appear in:	*Materials Chemistry and Physics*
Received Date:	19 January 2017
Revised Date:	12 June 2017
Accepted Date:	14 August 2017

Please cite this article as: Paweł Stelmachowski, Klaudia Ciura, Paulina Indyka, Andrzej Kotarba, Facile synthesis of ordered CeO_2 nanorod assemblies: morphology and reactivity, *Materials Chemistry and Physics* (2017), doi: 10.1016/j.matchemphys.2017.08.038

Facile synthesis of ordered CeO_2 nanorod assemblies: morphology and reactivity

Paweł Stelmachowski*, Klaudia Ciura, Paulina Indyka, Andrzej Kotarba

Faculty of Chemistry, Jagiellonian University in Krakow, Ingardena 3, 30-060 Krakow, Poland

* Faculty of Chemistry, Jagiellonian University in Krakow, Ingardena 3, 30-060 Krakow, Poland; phone: +48 12 6632246, fax +48 12 6340515, email: pawel.stelmachowski@uj.edu.pl,

Abstract

A two-step hydrothermal synthesis of nanostructured CeO_2 assemblies is reported. The main benefit of the presented approach is the usage of simple reagents and standard laboratory equipment which allows obtaining novel CeO_2 morphology. The CeO_2 nanostructured materials are characterised with respect to their surface (N_2-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 a model reactivity test. The physicochemical characterization and reactivity results are compared with CeO_2 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 Ce^{3+}, 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, CeO_2, methane oxidation, ceria, support, catalyst