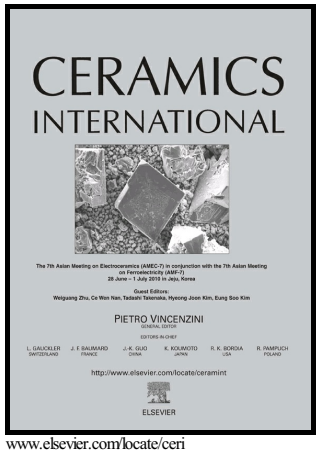
Hydrothermal synthesis and mechanism of triangular prism-like monocrystalline CeO_2 nanotubes via a facile template-free hydrothermal route

Fanming Meng, Jinfeng Gong, Zhenghua Fan, Huijie Li, Jiangtao Yuan



www.elsevier.com/locate/ceri

PII: S0272-8842(15)02222-1
DOI: http://dx.doi.org/10.1016/j.ceramint.2015.11.123
Reference: CERI11740

To appear in: *Ceramics International*

Received date: 30 September 2015
Revised date: 5 November 2015
Accepted date: 22 November 2015

Cite this article as: Fanming Meng, Jinfeng Gong, Zhenghua Fan, Huijie Li and Jiangtao Yuan, Hydrothermal synthesis and mechanism of triangular prism-like monocrystalline CeO_2 nanotubes via a facile template-free hydrothermal route *Ceramics International,* http://dx.doi.org/10.1016/j.ceramint.2015.11.123

Hydrothermal synthesis and mechanism of triangular prism-like monocrystalline CeO_2 nanotubes via a facile template-free hydrothermal route

Fanming Meng [a, b, *], Jinfeng Gong [a], Zhenghua Fan [a], Huijie Li [a], Jiangtao Yuan [a]

[a] *School of Physics and Materials Science, Anhui University, Hefei 230601, PR China*

[b] *Key laboratory of Materials Modification by laser, Ion and Electron Beams (Dalian University of Technology), Ministry of Education, Dalian 116024, PR China*

Abstract

Monocrystalline CeO_2 tablet-like nanostructures and triangular prism-like nanotubes were synthesized by thermal conversion of cerium carbonate hydroxide ($CeOHCO_3$) precursors prepared by a simple template-free hydrothermal method using $Ce(NO_3)_3 \cdot 6H_2O$ as cerium source, $CO(NH_2)_2$ as both precipitator and carbon source and polyvinylpyrrolidone (PVP) as surfactant. X-ray diffractometer (XRD) images inferred that the as-synthesized $Ce(CO_3)(OH)$ has a hexagonal structure, and the CeO_2 obtained by calcining the $Ce(CO_3)(OH)$ at 500℃ for 5 h has a cubic fluorite structure. Scanning electron microscope (SEM) was employed to reveal the transformation from tablet-like to triangular prism-like structures, and then to triangular prism-like nanotubes with the increase of temperature from 120 up to 200℃. Monocrystalline structure was revealed by high resolution transmission electron microscope (HRTEM) and select area electron diffraction (SAED) patterns. The thermal decomposition process of the as-synthesized $Ce(CO_3)(OH)$ was investigated

*Corresponding author at: School of Physics and Materials Science, Anhui University, 111 Jiulong Road, Hefei 230601, PR China. Tel.: +86 551 63861257; fax: +86 551 63861992.

E-mail address: mrmeng@ahu.edu.cn (F. Meng).