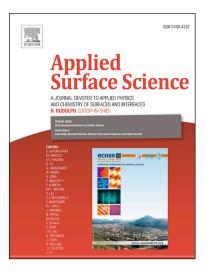
## Accepted Manuscript

#### Full Length Article

Nanocrystalline  $CeO_{2\mbox{-}\delta}$  coated  $\beta\mbox{-}MnO_2$  nanorods with enhanced oxygen transfer property

Xiubing Huang, Guixia Zhao, Yueqi Chang, Ge Wang, John T.S. Irvine

PII:	S0169-4332(17)33791-1
DOI:	https://doi.org/10.1016/j.apsusc.2017.12.197
Reference:	APSUSC 38067
To appear in:	Applied Surface Science
Received Date:	14 October 2017
Revised Date:	8 December 2017
Accepted Date:	21 December 2017



Please cite this article as: X. Huang, G. Zhao, Y. Chang, G. Wang, J.T.S. Irvine, Nanocrystalline  $\text{CeO}_{2-\delta}$  coated  $\beta$ -MnO<sub>2</sub> nanorods with enhanced oxygen transfer property, *Applied Surface Science* (2017), doi: https://doi.org/10.1016/j.apsusc.2017.12.197

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

# ACCEPTED MANUSCRIPT

## Nanocrystalline CeO<sub>2- $\delta$ </sub> coated $\beta$ -MnO<sub>2</sub> nanorods with enhanced

### oxygen transfer property

Xiubing Huang,<sup>a,b</sup> Guixia Zhao,<sup>b</sup> Yueqi Chang,<sup>a</sup> Ge Wang<sup>a\*</sup> and John T.S. Irvine<sup>b\*</sup> <sup>a</sup> Beijing Key Laboratory of Function Materials for Molecule & Structure Construction, School of Materials Science and Engineering, University of Science and Technology Beijing, Beijing, 100083, China.

<sup>b</sup> School of Chemistry, University of St Andrews, St Andrews, Fife, KY16 9ST, UK.
\*Corresponding authors: Prof. Ge Wang (<u>gewang@mater.ustb.edu.cn</u>) and Prof. John
T. S. Irvine (<u>jtsi@st-andrews.ac.uk</u>)

Abstract: In this research,  $\beta$ -MnO<sub>2</sub> nanorods were synthesized by a hydrothermal method, followed by a facile precipitation method to obtain nanocrystalline  $CeO_{2-\delta}$ coated  $\beta$ -MnO<sub>2</sub> nanorods. The as-prepared samples were characterized by XRD, HRTEM, FESEM, XPS and in-situ high-temperature XRD. The HRTEM results show that well dispersed CeO<sub>2-δ</sub> nanocrystals sized about 5 nm were coated on the surface of  $\beta$ -MnO<sub>2</sub> nanorods. The oxygen storage and transfer property of as-synthesized materials were evaluated using TGA under various atmospheres (air, pure N<sub>2</sub>, and 5% H<sub>2</sub>/95% Ar). The TGA results indicate that CeO<sub>2- $\delta$ </sub> modification could favour the reduction of Mn<sup>4+</sup> to Mn<sup>3+</sup> and/or Mn<sup>2+</sup> at lower temperature as compared with pure  $\beta$ -MnO<sub>2</sub> nanorods and the physically mixed CeO<sub>2-8</sub>- $\beta$ -MnO<sub>2</sub> under low oxygen partial pressure conditions (i.e., pure N<sub>2</sub>, 5% H<sub>2</sub>/95% Ar). Specifically, CeO<sub>2- $\delta$ </sub>@ $\beta$ -MnO<sub>2</sub> sample can exhibit 7.5 wt% weight loss between 100 and 400 °C under flowing N<sub>2</sub> and 11.4 wt% weight loss between 100 and 350 °C under flowing 5%H<sub>2</sub>/95%Ar. During the reduction process under pure  $N_2$  or  $5\%\,H_2/95\%\,Ar$  condition, the oxygen ions in  $\beta$ -MnO<sub>2</sub> nanorods are expected to be released to the surroundings in the form of  $O_2$  or  $H_2O$  with the coated CeO<sub>2- $\delta$ </sub> nanocrystals acting as mediator as inferred from the synergistic effect between the well-interacted CeO<sub>2- $\delta$ </sub> nanocrystals and  $\beta$ -MnO<sub>2</sub> nanorods.

**Keywords**: CeO<sub>2- $\delta$ </sub>;  $\beta$ -MnO<sub>2</sub>; oxygen transfer; synergetic effect

Download English Version:

# https://daneshyari.com/en/article/7835134

Download Persian Version:

https://daneshyari.com/article/7835134

Daneshyari.com