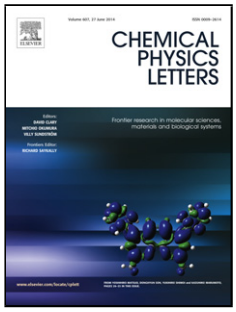

Title: Fabrication of super-microporous nanocrystalline zirconia with high thermal stability

Author: Jiaojiao Su Yongfeng Li Xiaoliang Yan Ruifeng LiFF

PII: S0009-2614(16)30112-9
DOI: http://dx.doi.org/doi:10.1016/j.cplett.2016.03.003
Reference: CPLETT 33689

To appear in:

Received date: 21-11-2015
Revised date: 1-3-2016
Accepted date: 2-3-2016

Please cite this article as: J. Su, Y. Li, X. Yan, R. LiFF, Fabrication of super-microporous nanocrystalline zirconia with high thermal stability, *Chem. Phys. Lett.* (2016), http://dx.doi.org/10.1016/j.cplett.2016.03.003

Fabrication of super-microporous nanocrystalline zirconia with high thermal stability

Jiaojiao Su, Yongfeng Li, Xiaoliang Yan, Ruifeng Li*

College of Chemistry and Chemical Engineering, Taiyuan University of Technology, Taiyuan 030024, China

Abstract: Super-microporous nanocrystalline zirconia (pore size 1 to 2 nm) was synthesized via the evaporation-induced self assembly (EISA) process with solid-liquid method. The acidic etching process of zirconia resulted in the formation of microporous material with surface area of 414 m^2/g in comparison with that of 141 m^2/g for the parent material when treated at 400℃. Even after calcination at 700℃, the pore structure was fairly preserved for the post-treated samples and the material still exhibited a high surface area of 223 m^2/g. However, for samples without post-treatment, their pore walls collapsed totally and surface area decreased drastically when calcinated at 550℃.

Keywords: Super-microporous zirconia; thermal stability; high surface area.

1. Introduction

Zirconia-based materials, especially zirconia (ZrO_2), have attracted much attention in recent years because of their extensive uses in many different ways, as catalysts or in the fields of ceramics, bioceramics, etc. [1-4]. For their extended application, zirconia materials are required to possess high specific surface area and high thermal stability. Hence, great effort has been made to synthesize porous zirconia materials with both large surface area and high thermal stability. Many methods, such as sol-gel, hydrothermal, precipitation, chemical vapor deposition (CVD), thermal decomposition and solid-state reaction method [5-13], have been used to synthesize porous zirconia. While porous zirconia, like other porous metal oxides, cannot resist high temperatures in most cases. Usually, the porous structure of the zirconia collapsed easily when the sample was heated at above 400℃[14]. The poor thermal stability of porous zirconia thus severely limits its practical

* Corresponding author. Tel./fax: +86 351 6010121.
E-mail address: rfli@tyut.edu.cn (R.F. Li)