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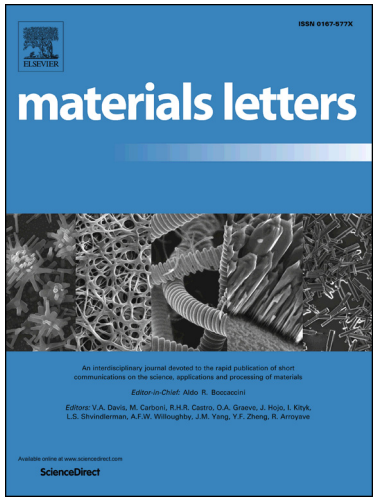

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Junying Tian, Peng Tian, Hongchang Pang, Guiling Ning

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A recyclable sacrifice-template route to prepare Al_2O_3 hollow microspheres

Junying Tian, Peng Tian, Hongchang Pang, Guiling Ning*

State Key Laboratory of Fine Chemicals and Faculty of Chemical, Environmental & Biological Science and Technology, Dalian University of Technology, Dalian 116024, China

** Corresponding author. Tel./Fax: +86 411 84986067. E-mail address: ninggl@dlut.edu.cn (G. Ning).*

Abstract

A novel route to prepare Al_2O_3 hollow microspheres with a diameter of about 6 μm is presented by the way of using $CaMg(CO_3)_2$ microspheres as the recyclable sacrifice-template and aqueous solution of $Mg(NO_3)_2$ and $Ca(NO_3)_2$ as dispersant. The dispersant can not only control the reaction rate of ion-exchange to synthesize Al_2O_3 hollow microspheres, but also act as a reactant to recycle the templates. Moreover, the as-obtained Al_2O_3 hollow microspheres possessed a surface area of 214.8 m^2 $g^{-1}$and a pore volume of 0.9117 cm^3 g^{-1}, which are higher than many reported porous Al_2O_3 materials. These advantages make this route economical and efficient to prepare Al_2O_3 hollow microspheres, and promising in large-scale preparation of other metal oxides hollow structures.

Keywords: Al_2O_3; Hollow microspheres; Sacrificial template; Microstructure; Porous materials

1. Introduction

Metal oxides hollow structures have widely potential applications in catalysts, gas sensor, battery, photoelectric devices and so on, based on their properties of low density, thermal insulation, high surface area, high loading capacity and relatively stable structure.[1-8] In hollow structures synthesis, the sacrificial templates route was considered as a straightforward, versatile, and effective approach, because the sacrificial templates not only played the role of templates to directly determine the shape and approximate cavity size of the resultant hollow structures, but also acted as reactants to lead the formation of shell.[1] Motivated by these attractive characteristics, sacrificial templates routes were widely researched to prepare metal oxides hollow microspheres and other hollow structures.[9-13] Despite technical success, most of the reported sacrificial templates such as metal, oxides and salt particles have been consumed and not recycled, which may increase environmental concerns and manufacturing cost in large-scale synthesis. Thus, developing recycle template materials with sacrificial property is an important

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