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Designing of one-dimensional C/Ce-compound composite materials

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Abstract: For practical application of Ce material, one-dimensional C/Ce-compound (CeF₃ and CeO₂) composite materials were successfully designed. Carbon skeleton with unique interconnected porous structure and high specific surface area were manufactured by electro-blown spinning method, using polyvinyl pyrrolidone as the carbon precursor and polytetrafluoroethylene as the pore forming agent. CeF₃ and CeO₂ nanoparticles were uniformly doped in PCNF framework by in-situ encapsulation and hydrothermal methods, respectively. The porous nanofiber skeleton was beneficial to overcome the agglomeration and recycling problem of Ce-compound nanoparticles. This designed structure provided a promising strategy to ameliorate nanostructure material, suggesting potential application in catalyst and energy storage system.

Keywords: Porous materials; Carbon materials; Nanofibers; Nanoparticles

1. Introduction

Recently, cerium (Ce) as a kind of favorable catalytic materials jumps into researchers' sight owing to its outstanding redox property and fast switching of the oxidation state between Ce³⁺ and Ce⁴⁺ [1]. The oxide of cerium (CeO₂) possess all of these unique characteristics which have been widely used in various fields, such as wet air oxidation (WAO) catalysts [2], supercapacitor electrodes [3], oxygen storage materials [4], etc. Another Ce-compound, cerium fluoride (CeF₃), is also considered to

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