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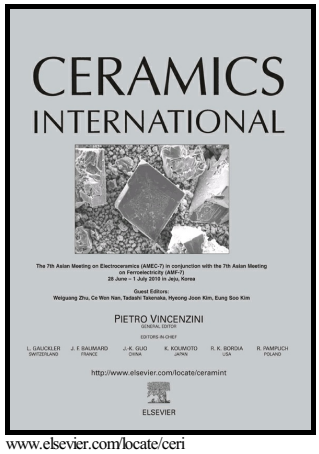

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Nanostructured CeO_2 for selective-sensing and smart photocatalytic applications

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Abstract

Well crystalline CeO_2 nanoparticles have been successfully synthesized via solution combustion synthesis (SCS) using $(NH_4)_2[Ce(NO_3)_6]$ and $C_4H_6O_6$ as oxidizer and fuel. The structural characteristics of as-synthesized material were investigated in terms of FESEM, HRTEM, EDS, XRD, FTIR and UV-Vis spectroscopy techniques. The surface area of synthesized CeO_2 nanoscale material was obtained from BET plot. Results showed a pure, well-crystallized, flake-like mesoporous material to be formed with crystallite size of 18.86 nm. The focus of this study was to investigate the application of as-synthesized CeO_2 nanomaterial for sensing and photocatalytic degradation of picric acid (PA) in its aqueous solution. It was found to be highly selective for PA detection in aqueous solution when compared with other aromatic compounds. Detection limit (0.52 µM) for PA when compared with earlier studies was found to be much better. In addition, 0.05 gm of as-synthesized CeO_2 is found to be optimum amount ensuring maximum catalytic photodegradation of 10 ppm PA in aqueous solution. These experimental findings point out that as-synthesized CeO_2 nanomaterial can be efficiently used as an effective chemical sensor and photocatalyst.

KEYWORDS

CeO_2 nanostructure; photocatalyst; luminescence; chemical sensor; picric acid

1. Introduction

The past few years have witnessed significant research efforts devoted to fabricate nanoscale CeO_2 materials. Taking the advantage of their excellent redox and high oxygen storage capacity (OSC) properties, CeO_2 nanoscale materials are widely explored for technological applications in various fields [1-3]. For example, Karakoti et al. [4]