

## Abstract

Continuous-flow synthesis of one-dimensional (1D) metal oxide nanostructures and/or their integration into hierarchical structures under nonthermal conditions is still a challenge. In this work, a nonthermal, continuous-flow approach for the preparation of  $\gamma$ -manganese oxide ( $\gamma$ -MnO<sub>2</sub>) and cerium oxide (CeO<sub>2</sub>) microspheres has been developed. By this technique,  $\gamma$ -MnO<sub>2</sub> materials with surface areas of 240, 98, and 87 m<sup>2</sup>/g and CeO<sub>2</sub> microspheres with a surface area of 1 m<sup>2</sup>/g have been fabricated successfully. Characterization of the materials was carried out using powder X-ray diffraction, infrared and inductively coupled plasma optical emission spectrometer (ICP/OES), nitrogen sorption, scanning electron microscopy, transmission electron microscopy, and thermogravimetric analysis. The synthesized materials showed good catalytic activity in the oxidation of  $\alpha$ -methyl styrene.