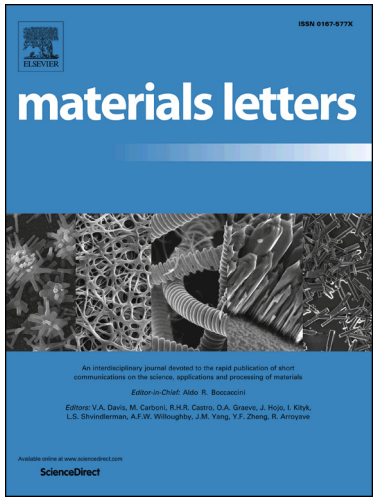

Size-effect on the optical behavior of Fe-doped CuO nanoparticles synthesized by a freeze-drying process

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Abstract

$Cu_{1-x}Fe_xO$ nanoparticles were prepared by freeze-drying an aqueous solution of cooper and iron acetates, followed by a heat treatment. The material was characterized regarding structural, morphological and optical properties by high-resolution X-ray diffraction, transmission electron microscopy and UV-Vis diffuse reflectance. All samples prepared in the $0 \leq x \leq 0.04$ concentration range exhibited a single phase, corresponding to monoclinic structure (space group C2/c). Increasing the iron doping level resulted in the contraction of the unitary cell volume and in the decrease of the particle size and bandgap. The correlation between particle size, bandgap and iron concentration represents a key information to tuning the material for semiconductor applications.

Keywords: Copper oxide, Nanoparticles, Iron-doped, Freeze-drying, X-ray techniques, Bandgap.

1. Introduction

Nanostructured transition metal oxides have been attracting attention due to their physical properties and technological applications. In particular, cupric oxide nanostructures are of special relevance because their key properties as a p-type semiconductor with a narrow