Solution combustion synthesis of ZnO powders using mixture of fuels in closed system

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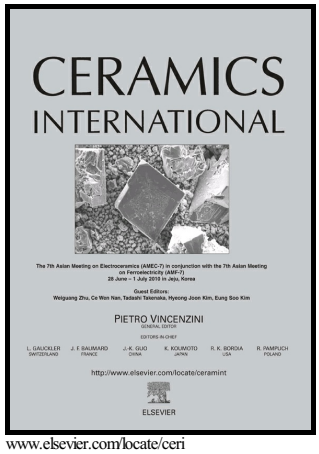

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Abstract

Single phase ZnO powders with wurtzite structure were synthesized by solution combustion method using various amounts of mixed glycine-citric acid fuel in the presence (open system) and absence (closed system) of air oxygen. Phase evolution, microstructure and optical properties were investigated by thermal analysis, X-ray diffractometry, electron microscopy and Raman, photoluminescence (PL) and diffuse reflectance spectrometry techniques. Rapid combustion reaction in closed system led to weak crystallinity, as confirmed by deep-level emissions in PL spectra. Larger spherical particles (~200 nm) were synthesized in open system at ϕ=1. The as-combusted ZnO powders in closed system exhibited higher photocatalytic activity under ultraviolet irradiation, due to their higher adsorption capacity of methylene blue on ZnO surface. Photodegradation rate increased with the increase of fuel content in as-combusted ZnO powders produced by open route as a result of the reduction of particle size and band gap energy.

Keywords: ZnO; Solution combustion synthesis; Mixture of fuels, Photocatalytic activity;

1. Introduction