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Antimicrobial properties of green synthesis of MgO micro architectures via *Limonia acidissima* fruit extract

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ABSTRACT

This paper reports a simple ecofriendly green combustion synthesis of magnesium oxide (MgO) micro architectures using various concentrations of *Limonia acidissima* fruit extract. The powder X-ray diffraction (PXRD) patterns of the as-formed product show single cubic phase and no further calcination was required. The crystallite size was obtained using Scherer's formula and was found to be 4–8 nm. The structural analysis was further analysed by Rietveld refinement technique. The morphology of combustion derived MgO micro architectures (NPs) were studied by using Scanning electron microscope. Various shaped nanostructures were obtained with different reaction parameters such as fuel concentration, pH and calcination temperatures. The Fourier transform infrared spectral studies reveal the various bond stretching in the prepared micro architectures. The growth mechanism for the formation of flower like structures were proposed. The diffuse reflectance spectral studies were carried out and energy band gap were estimated from the DRS spectra and the values ranges between (5.06–5.66 eV). Photoluminescence (PL) studies were carried upon exciting at 342 nm. A broad emission peak centered at ~399 nm and 481 nm in the bluish-violet region was recorded. The Chromaticity diagrams were studied and found that MgO NPs emit bluish-violet color. Further, the obtained NPs were investigated for their antibacterial and antifungal activity. The results indicated that MgO NPs were effectively used as good candidates for antibacterial, waste water treatment, food safety applications and biomedical markers.

1. Introduction

Nanomaterials offer auspicious opportunities for enhanced and tailored assets to use in various fields owing to their sole physicochemical properties, produced by their nanosized dimensions and large surface to volume ratios (Talebian et al., 2013). Nanomaterials are of special interest not only for basic research, but also for their interesting applications in various fields including flat panel displays, solar energy converters, optical amplifiers, electroluminescent devices, photodiodes, bio-detectors, color display, catalysts, host for solid state lasers, solid electrolytes, chemical sensors, magnetic refrigeration materials, substrates for high-temperature superconductor deposition, thermal barrier coatings, etc (Norris et al., 2008; Si et al., 2005; Yang et al., 2003; Choi et al., 2004; Medenbach et al., 2001).

Magnesium oxide (MgO) is an important wide band gap semiconductor/insulator material which crystallizes in rock salt/sodium chloride (NaCl) type cubic structure. Further, MgO is found to be extremely significant owing to its multi functional applications in water purification, catalysis, refractory, paint, luminous ceramics, and superconductor products (Zawadzki, 2008; Chavan et al., 2008 and Jin et al., 2012a,b), due to high specific surface area of MgO nanomaterials, they are found to catalyse efficiently in variety of organic reactions (Aruna and Mukasyan, 2008; Ianos and Lazau, 2009 and Umesh et al., 2012), Also it plays very important role in biological and medical applications for cancer therapy (Premkumar et al., 2013; and Krishnamoorthy et al., 2012). Various kinds of fabrication techniques are employed to synthesize MgO micro architectures such as Chemical vapour deposition (CVD) (Zawadzki, 2008), Pulsed laser deposition (PLD) (Jin et al., 2012a,b), Laser ablation (Aruna and Mukasyan, 2008), Molecular beam epitaxy (MBE) sputtering method (Chen et al., 2004),

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