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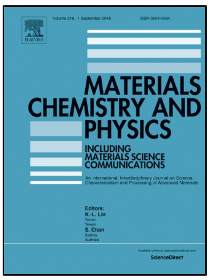

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Seyed Soroush Haji Seyedrazi, Ehsan Taheri-Nassaj

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Effects of Y_2O_3 Additive Percentage on MgO Ceramic by Co-Precipitation and SPS Methods

Seyed Soroush Haji Seyedrazi[1], Ehsan Taheri-Nassaj[*2]

[1,2]Department of Materials Science and Engineering, Tarbiat Modares University, Tehran, PO Box: 14115-143, Tehran

Abstract

MgO nanopowders were synthesized through the co-precipitation method with different Y_2O_3 percentages (0, 2.5, 5, and 10 Wt. %). The nanocomposite powder was characterized by thermal gravimetric-differential thermal analysis (TG-DTG-DTA), X-ray diffraction (XRD), Fourier transform infrared (FTIR), and field-emission scanning electron microscope (FESEM) analysis. Y_2O_3 can have positive effect on synthesis and sintering of MgO-Y_2O_3 ceramic likewise particles size and densification process. Crystallite size decreased with increasing amount of Y_2O_3 additive, and it was 32.6 nm for MgO-10%, and the average particle size by FESEM image was 52.2 nm for this sample. Lattice parameter increased (from 4.2188 to 4.2243 A^0) by increasing the additive percentage from 0 to 5%, but it decreased (4.2195 A^0) in 10% additive. Nanopowder was sintered by the SPS technique at 1400℃. MgO-2.5% sample had the highest relative density (99.1%) and transmittance (15%), with an average grain size of 0.41 μm. MgO-5% sample, however, had the highest hardness (10.57 GPa), thanks to the finer average grain size (0.25 μm).

Keywords: MgO, Yttria, Sintering aid, SPS, Ceramic Processing

1. Introduction

Magnesium oxide is one of the best ceramic materials, one which has outstanding physical and chemical properties likewise high melting point, excellent transparency, remarkable hardness, and high chemical resistance against corrosive materials. Because of these remarkable features, it

* Corresponding author.
E-mail address: taheri@modares.ac.ir (E. Taheri-Nassaj). Tel: 0098-21-82883306 / fax: (+98)21-88005040.