

Garnet ferrite (Y₃Fe₅O₁₂) nanoparticles prepared via modified conventional mixing oxides (MCMO) method

ABSTRACT

This paper is presented an improvement in the conventional mixing oxides method as a way of trying to improve the manufactured technique to prepare ferrite materials. In this study, yttrium iron garnet (YIG) nanoparticles was synthesized by a modified mixing oxides (MCMO) method. In this research, utilization of an organic compound (ethanol) and metal oxides in conjunction with mixing the reactants directly without adding water are the key techniques of this method. The sample powder was characterized by using x-ray diffraction (XRD) to confirm the garnet phase. Microstructure observation of the sample has been carried out via field emission scanning electron microscopy (FESEM) and transmission electron microscopy (TEM). Well defined single-phase garnet structure, with an average particle size of 39 nm was formed at 1350 °C. Density value of 5.245 g.cm⁻³, was calculated for YIG sample, which is reached around 99% of its theoretical density. MCMO technique appears to be another alternative to the conventional (manufactured) technique, due to the decreasing of the particle size with better homogeneity, high purity, reduction of the cost, and high yield in a nano-scale product compared to other preparations techniques.

Keyword: Garnet ferrite; Y₃Fe₅O₁₂; Nanoparticles; Modified conventional mixing oxides