Effect of variation sintering temperature on magnetic permeability and grain sizes of Y3Fe5O12 via mechanical alloying technique

ABSTRACT

his work will focus on the preparation of yttrium iron garnet (Y3Fe5O12, YIG) via mechanical alloying technique derive by steel waste product. The Fe2O3 powder derived from the steel waste purified by using magnetic and non-magnetic particles (MNM) and Curie temperature separation (CTS) technique. The purified powder was then oxidized in air at 500 °C for 9 hours in air. The Fe2O3 was mixed with Y2O3 using high energy ball milling for 9 hours. The mixed powder obtained was pressed and sintered at different temperature 500/600/700/800/900/1000/1100 °C. X-ray diffraction (XRD) shows the YIG is completely form at 1100 °C. The field emission scanning electron microscopy (FESEM) images shows the grain size increases as increase the sintering temperatures. The frequency dependence on the complex permeability, μ' and magnetic loss, μ'' in the frequency range 10 MHz to 1 GHz were measured in this study. The results showed that the highest μ′ is 5.890 obtained from 1100 °C.

Keyword: Porous cavity; Wavy wall; Thermal dispersion; Nanofluid; Numerical results