Effect of sintering temperature on crystallography and microstructure of yttrium iron garnet via mechanical alloying technique

ABSTRACT

This work focused on the preparation of yttrium iron garnet (Y3Fe5O12, YIG) via mechanical alloying technique derived by steel waste product. The steel waste was purified by using magnetic and non-magnetic particles (MNM) and Curie temperature separation (CTS) technique. The powder from the CTS technique was oxidized at 500°C for 9 hours in air to form the iron oxide (Fe2O3). The Fe2O3 was mixed with Y2O3 using high energy ball milling for 9 hours. The obtained mixed powder was pressed and sintered at varied temperature 500/600/700/800/900/1000/1100/1200 °C. X-ray diffraction (XRD) showed the YIG was completely formed at 1100°C. The crystallite size and grain size of YIG powder were observed. The results show the grain size and crystallite size increased as a function of sintering temperatures.

Keyword: Yttrium iron garnet (Y3Fe5O12, YIG); Mechanical alloying technique; Steel waste