

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 ($Y_3Fe_5O_{12}$, 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 (Fe_2O_3). The Fe_2O_3 was mixed with Y_2O_3 using high energy ball milling for 9 hours. The obtained mixed powder was pressed and sintered at varied temperature $500/600/700/800/900/1000/1100/1200^\circ\text{C}$. 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 ($Y_3Fe_5O_{12}$, YIG); Mechanical alloying technique; Steel waste