

MAGNETIC PROPERTIES EVOLUTION IN YTTRIUM IRON GARNET: TREND OF SINGLE-SAMPLE AND MULTI-SAMPLE SINTERING

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ABSTRACT

The influence of sintering scheme on the evolution of magnetic and morphological properties in polycrystalline Yttrium Iron Garnet (YIG) has been investigated. The samples were prepared by using High Energy Ball Milling (HEBM) technique followed by 2 different sintering schemes: (1) single-sample; (2) multi-samples; both sintered from 600⁰C up to 1400⁰C. The samples have been characterized on its phase purity, grain size distribution and B-H loop; and the relationships among these factors have been analyzed during its evolution. With great experimental care, both the single-sample and multi-sample sintering batches yielded highly similar variation of magnetic properties vs microstructure of YIG. The results show that clearly evolution of hysteresis behaviour and complex permeability is attributed to the improvement of phase purity and grain size distribution with increment of sintering temperature. 3 different groups were apparent in the B-H hysteresis loop, indicates a 3 different types of magnetism-dominancy: weak, moderate and strong ferromagnetism. That well-defined B-H loop shape was observable only when sufficient single-phase purity and crystallinity and also a sufficiently high volume fraction of grains with diameters >0.5 μ m (multe-sample sintering) or >0.6 μ m (single-sample sintering) were attained.

Keywords: Soft Ferrimagnetic Material; Yttrium Iron Garnet; Magnetic Properties; Morphological Properties

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