Grown Considering Lattice Mismatch and Crystal Quality and Magneto-Optical Properties of Bismuth and Manganese co-doped Rare Earth Iron Garnet Crystal

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Rare earth iron garnet crystals with perpendicular magnetic anisotropic have significant application prospects in spin polarizer [1], spin-torque oscillator [2] and optical-magnetic storage [3] due to their perpendicular magnetization features and excellent magneto-optical properties. In this work, Bi:YIG and Bi,Mn:YIG single crystal films were grown along the direction of [111] by liquid phase epitaxial (LPE) method [4,5]. The results of analyzing the X-ray diffraction patterns; scanning electron microscopic image; transmittance spectra; the Faraday rotation spectra and magneto-optical loops of single crystal films show that they have a much higher Verdet constant and specific Faraday rotation angle than commercial materials such as TGG, and the Mn^{3+} content has improved on the basis of ensuring lattice match which is conducive to the construction of out-of-plane (OP) magnetization easy axis. The effects of growth parameters on crystal quality and lattice match during crystal growth have been discussed. The growing Bi:YIG has a specific Faraday rotation angle of -153deg/cm at 1550nm, a Verdet constant of -1026rad/(T*m) and a transmittance rate of 74%.

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