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Magnetic domains and magneto-optic responsivity of bismuth-doped iron garnet films DONG HO WU, MANNIX SHINN, Naval Research Laboratory — It is well known that diamagnetic dilution of iron (Fe) and gallium (Ga) in bismuth-doped iron garnet materials increases the Faraday rotation response (i.e. magneto-optic responsivity). However, our experiments indicate that such enhancement of the magneto-optic (MO) responsivity is a macroscopically averaged effect. Careful MO responsivity measurements at a magnetic field exceeding a certain critical field H_c , reveal Barkhausen steps, a step-like responsivity curve which is due to pinning effect in the domain walls. The critical field H_c varies sensitively even with a slight change of Fe and Ga in the MO material. Also, our polarization microscopy indicates the magnetic domain structure seems to be sensitively dependent on the chemical content of the MO material. We suspect that the variation of the chemical composition alters chemical inhomogeneities and stress in the MO crystal, leading to drastic changes in pinning sites and the domain wall behavior. We will present our experimental results on the magnetic domain behavior and the magneto-optic responsivity as a function of the chemical components.

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