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Epsilon iron oxide nanomagnets exhibiting large magnetic anisotropy

ε-Fe2O3 is one of the polymorphs of Fe2O3, which was first discovered by our group as a pure phase. This material exhibits a large coercive field over 20 kOe at room temperature [1]. Due to its strong magnetic anisotropy, ε-Fe2O3 also exhibits high-frequency electromagnetic wave absorption in the millimeter wave region, and the physical properties could be widely controlled by metal substitution [2,3]. In this work, we report highly oriented magnetic films of metal-substituted ε-Fe2O3 nanoparticles dispersed in resin [4,5]. Oriented film was prepared by dispersing metal-substituted ε-Fe2O3 nanoparticles into vehicle resin and drying under an applied external magnetic field. X-ray diffraction (XRD) pattern of the oriented film showed a very high degree of orientation with a strong single peak from the 200 reflection, indicating that the crystallographic a-axis is oriented along the out-of-plane direction of the film. The angular dependence of the magnetic hysteresis loops at room temperature shows a rectangular hysteresis loop with a coercive field of 9.7 kOe and a magnetization value of 30.4 emu g−1 at 7 T when the external field is along the out-of-plane direction with respect to the plane of the film, indicating that the easy axis corresponds to the crystallographic a-axis.

Biography

Marie Yoshikiyo received her M.Sc. in Chemistry from the University of Tokyo in 2013, and pursuing her Ph.D. under the supervision of Prof. Shin-ichi Ohkoshi. She is currently a Project Assistant Professor of Department of Chemistry, School of Science at the University of Tokyo. Her research interests focuses on the development of functional materials, especially magnetic nanomaterials based on iron oxides.

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