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The synthesis of metal-substituted ε-iron oxide nanomagnet exhibiting large magnetic anisotropy and high-frequency millimeter wave absorption

Epsilon iron oxide, ε-Fe_2O_3, is a polymorph of iron oxide. This phase is obtained as a stable phase in nanometer size region. Our group have reported the synthesis of pure ε-Fe_2O_3 for the first time by utilizing chemical nanoscale synthesis method [1]. ε-Fe_2O_3 has receive much attention due to its large magnetic anisotropy, e.g., the coercive field of 25 kOe at room temperature [2] , which is the largest value among magnetic metal oxides. In this presentation, we report the synthesis of metal subsutituted ε-Fe_2O_3 (ε-$M_xFe_{2-x}O_3$), crystallographic orientation of ε-$M_xFe_{2-x}O_3$ nanoparticles, and the magnetic properties. Especially, rhodium subsutitution enlarges the coercive field up to 35 kOe [3,4]. Especially, rhodium subsutitution enlarges the magnetic coercive field up to 35 kOe [3,4]. Due to the large magnetic anisotropy, ε-Fe_2O_3 and ε-$M_xFe_{2-x}O_3$ show the electromagnetic wave absorption in a millimeter wave region of 35–222 GHz, which is the highest frequency electromagnetic wave absorption caused by the zero-field ferromagnetic resonance. The present materials are to be useful for recently developed millimeter wave technology such as car radar and high-speed wireless communication.

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Biography

Asuka Namai is currently an Assistant Professor of Department of Chemistry, School of Science at The University of Tokyo. She received her PhD in Science at the University of Tokyo, Japan, in 2013. Her research focuses on the development and physical and chemical characterization of functionalized nanomaterials, with particular interest in iron oxide-based nanomagnets and magnetism.

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