



Contribution ID: 237

Type: **Poster**

Fabrication of Advanced Soft Magnetic Nanomaterials Using the Radiation

Thursday, 27 April 2017 14:15 (2 hours)

Soft magnetic materials have been investigated for applications in magnetic devices such as transformers, inductor, electromagnetic (EM) wave shielding, etc. Its magnetic properties are determined by composition, crystal structures and size. Many kinds of researches are focused on the control of material size chemically and mechanically. Synthesis of particles using an electron beam (EB) irradiation provides stable and high quality. In this study, we synthesized the iron oxide particles using a 10 MeV EB irradiation. This material has fine nano-sphere with Fe₃O₄ phase in the result analysis of FE-SEM and XRD. And it also possible to fabricate the α -Fe₂O₃ phase with different precursor compositions. As increasing the electron beam irradiation dose, the saturation magnetization of particles dramatically increased up to 300 kGy. This result is related to the growth of crystal phase. To evaluate the uses of this material in high frequency, the complex permittivity and permeability of composite were measured by network analyzer from 300 kHz to 8.5 GHz in forms of composite in wax matrix. This material shows the high return loss (over than -40 dB) near the 6 GHz. These results clearly demonstrate that the radiation is a good candidate for the nanoparticle fabrication and industrial applications.

Country/Organization invited to participate

Korea, Republic of

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Session Classification: P-A2

Track Classification: RADIATION SYNTHESIS AND MODIFICATION OF MATERIALS