RD10

The Change of Magnetic Properties in the Ion Irradiated Fe-Cr Alloys

D.G.Park*[1], K.C.Heo[1], G.D.Kim[1], W.W.Kim[1], and Y.M.Cheong[1]

[1]Korea Atomic Energy Research Institute, Yusung P.O.Box 105, Taejon 305-600, South Korea.

*Corresponding author: dgpark@kaeri.re.kr, Phone: +82 42 868 2023, Fax: +82 42 868 8549.

Fe-Cr alloys are the candidate structural materials for the fusion reactor applications, and often used as a model alloy for studying the basic mechanisms governing their behaviour under irradiation. In this study, Fe and Si ions are irradiated on the Fe-Cr alloys having 5% and 9% of Cr contents. The magnetic Barkhausen Noise (BN), Hysterisis loop, and Ferro Magnetic Resonance (FMR) experiments are conducted to investigate the change of magnetic properties under the ion irradiation. The BN and FMR resonance fields are increased with increasing the ion dosage, and change of saturation magnetic field is also showed the similar trend. The defects created by ion irradiation are seems to be responsible for the change of magnetic properties.

RD11

Effects of Powder Oxidation on the Properties of Powder Cores

Pyungwoo Jang, Sangryul Park, and Inbum Jeong[1]

Division of Applied Science, Cheongju University, Cheongju 360-764, Korea

[1]R&D Center, Changsung Corporation, Namdong Industrial Area, Incheon 405-100, Korea

*Corresponding author: pwjang@cju.ac.kr, Phone: +82 43 229 8553, Fax: +82 43 229 8432

Magnetic metal powder cores have been widely used in power supplies of many electronic equipments. Non-magnetic insulating layer between metallic particles plays an important role in reducing eddy current loss and promoting demagnetization field. In order to form uniform and dense oxide layer, many insulation coating technique have been reported such as alumina colloidal coating, phosphate coating and others[1]. In this study water vapor as well as air oxidation technique was tested with an emphasis on reducing core loss of metal powder cores. Mo-permalloy, 50Fe-50Ni, sendust and Fe-Si powder was oxidized at 400 - 800°C in nitrogen and water vapor mixture gas (NW gas) with a constant dew point, which was made such that 100°C water vapor was passed in a water chamber preset at constant temperature. Oxidized metal powder was mixed with or without coating agent, and then compacted to toroid core under a pressure of 1176 MPa. Compressed toroid cores were annealed in N_2 atmosphere to reduce residual stress at a high temperature depending on the powder type. When Ni-Fe powder was oxidized in the air and NW atmosphere, Fe_2O_3 and $NiFe_2O_3$ ferrite was formed, respectively. Even though the resistivities of Fe_2O_3 and $NiFe_2O_3$ ferrite are 4 10-3 and 103 - 104 cm, respectively, core loss was not so much improved when Ni-Fe powder was oxidized in any atmosphere. This was thought to be due to relatively high conductivity of the $NiFe_2O_3$ferrite compared with that of alumina. When sendust powder was oxidized in the NW gas, no peak other than sendust peaks could be detected in XRD, which might be due to very dense and thin oxide layer of sendust powder. Sendust is Fe-Al-Si inter-metallic compound which is hard oxidized. When sendust powder was oxidized in the NH gas at 600°C, core loss could be reduced by 12 % after 20 min annealing. Optimum oxidation time of sendust powder decreased with increasing oxidation temperature. When oxidized at 800°C, optimum time decreased to 10 min. Permeability decreased with increasing oxidation time, which means the formation of oxide insulating layer. Contrary to sendust powder, core loss of Fe-Si powder core increased very sharply even in 10 min when oxidizing the powder in the NH atmosphere at 800°C. The reason for the sharp increase is thought to be due to very high rate of formation of porous oxide layer. Detailed microstructure as well as core loss analysis will be presented on the conference.

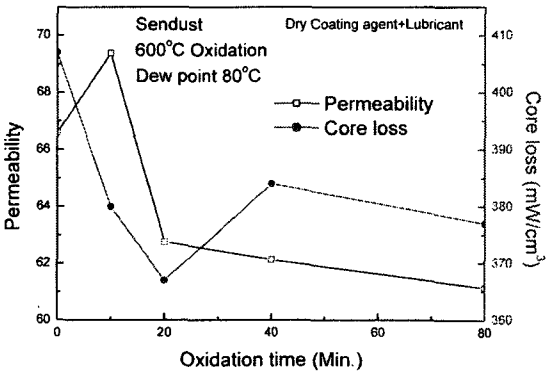

Fig. 1. Variation of permeability and core loss of sendust powder cores with oxidation time

REFERENCES

[1] Shin Tajima, Takeshi Hattori, Mikio Kondoh, Hidefumi Kishimoto, Masaki Sugiyama, and Tadayoshi Kikko, IEEE Trans. Magn., **41**, 3280(2005)