AF-3-5 (Oral)

Magnetic simulation of $Nd_2Fe_{14}B/\alpha$-Fe nanocomposite magnets in 2D and 3D nanoscale

Choong Jin Yang[1*], Jong Soo Han[2], and Eon Byeung Park[1]

[1]*Nanotechnology Rsearch Lab., Research Institute of Industrial Science & Technology (RIST), Pohang City, 790-330, P.O.Box 135, Korea*

E-mail : cjyang@rist.re.kr

[2] *Dept. of Physics, Yeungnam University, Gyungsan City, 712-749, Korea*

Micromagnetic models of assemblies of randomly oriented, exchanged coupled nanocrystals consisting of magnetically hard $Nd_2Fe_{14}B$ and very soft alpha Fe have been simulated. The modeling of two-dimensional chessboard consisted of 50 vol. % hard and 50 vol.% soft nanocrystals with the size varying from 5, 10, 25, to 50 nm. Hysteresis curves of each model system were obtained by solving the Landau-Lifshitz-Gilbert equation by time integration of the stiff differential equations. The simulation was focused on the effect of domain size and distribution in each nano crystal of fixed size. Eventually the simulated results were compared with magnetic properties obtained from experimental results of NdFeNbB based magnetic alloys showing the identical grain sizes to the simulated model. The present study exhibited the important role of soft phase, alpha Fe in this study, in terms of distribution of Fe as a grain boundary phase surrounding the matrix $Nd_2Fe_{14}B$ grains.