

부양중발가스응축장치로 제조한 페라이트 나노분말의 특성연구

The study of properties for Fe_3O_4 and NiFe_2O_4 nano powders synthesized by levitational gas condensation (LGC) method

Nuclear Nano Materials Development Lab., Korea Atomic Energy Research
Institute (KAERI)

Y. R. Uhm, B. S. Han, M. K. Lee, W. W. Kim and C. K. Rhee

High purity Fe_3O_4 , NiFe_2O_4 powders were synthesized by a LGC method using micron powder feeding system, and its characterization was carried out by using XRD, TEM, XPS and Mössbauer spectroscopy. The TEM images for Fe_3O_4 and NiFe_2O_4 showed spherical particles. The range of particle size for Fe_3O_4 is from 14 to 26 nm. In case of NiFe_2O_4 , it is from 8 to 22 nm. Mössbauer spectra for Fe_3O_4 consist of two sets of six Lorentzian lines corresponding to octahedral and tetrahedral sites. Two sets of sextet at Mössbauer spectrum for Ni-ferrite correspond to trivalent iron with size ranges from 12 to 25 nm at the Td and the Oh sites. Two doublets correspond to Fe^{3+} ion and Fe^{2+} ion at Oh site. The isomer shift of 0.54 (mm/s) for the second doublet exhibits that the sample contains Fe^{2+} ionic state. It means there are Ni^{3+} ions in the samples to have shown optimum charge valance and compensation. The analysis of Fe 2p3/2 photoelectron peak indicates different ionic state of Fe. The 2p3/2 peak at 709.5 and 711.2 eV is associated with Fe^{2+} and Fe^{3+} . The sample shows two peaks at 854.43 due to Ni^{2+} and 855.96 eV due to Ni^{3+} . From the results of Mössbauer spectrum and XPS, Ni-ferrite synthesized by LGC include unusual ionic state and it can be looked forward to attracting hole effect on the surface layer of particles.