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Structure and applied-field Mössbauer studies of NiCuZn ferrite

Yong Hui Li, Woochul Kim, and Chul Sung Kim[a)]
Department of Physics, Kookmin University, Seoul 136-702, Korea

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$Ni_{0.6}Cu_{0.2}Zn_{0.2}Fe_2O_4$ powder was synthesized by the solid-state reaction method. The crystal structure was found to be a cubic spinel with the lattice constant a_0 of 8.373 Å and internal structure parameter (x) of the oxygen was 0.254. Ni and Cu ions in NiCuZn ferrite prefer octahedral sites *B* and Zn ions prefer tetrahedral sites *A*. Based on the distribution probability, we have analyzed Mössbauer spectra measured at 4.2 K as 5 sets with six-lines. Hyperfine fields of *A* and *B* sites at 4.2 K in zero magnetic field were $H_{hf}(B_0) = 547$ kOe, $H_{hf}(B_1) = 532$ kOe, $H_{hf}(B_2) = 519$ kOe, $H_{hf}(B_3) = 491$ kOe, and $H_{hf}(A) = 507$ kOe. Applied-field Mössbauer spectra of the $Ni_{0.6}Cu_{0.2}Zn_{0.2}Fe_2O_4$ were measured with external field under 50 kOe, parallel to the incident γ-ray at 4.2 K. The hyperfine field $H_{hf}(A)$ of *A* sites under 50 kOe was 521 kOe, larger than that under no applied-field. At *B* site the average value of hyperfine field $\langle H_{hf}(B) \rangle$ was 447 kOe, smaller than $\langle H_{hf}(B) \rangle = 522$ kOe under no applied-field. Also, we noticed that the second and fifth absorption lines of Mössbauer spectra completely disappeared above 10 kOe, indicating that the spins of Fe ions at *A* and *B* sites were collinear to the applied-field. The Fe valence state was determined to be ferric from the isomer shift values. © *2011 American Institute of Physics.* [doi:10.1063/1.3549556]