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ABSTRACTS

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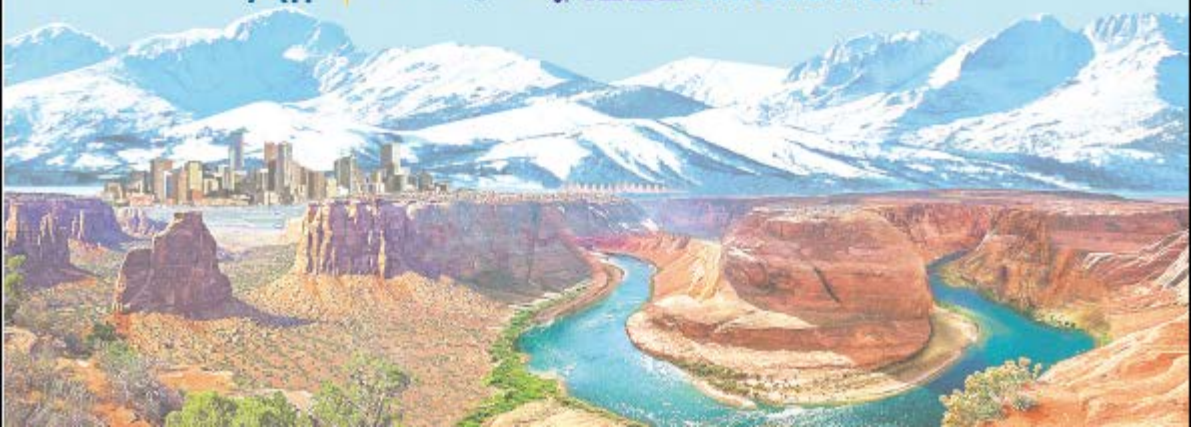

CX-02. Magnetic properties of Ni substituted Y-type Barium Ferrite.

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Y-type barium hexaferrite is attractive material for various applications, such as high frequency antennas and RF devices, because of its interesting magnetic properties. Especially, Ni substituted Y-type hexaferrites have higher magnetic ordering temperature than other Y-type. We investigated the system with both macroscopic and microscopic properties such as crystalline and magnetic measurement. The single phase $Ba_2Co_{2-x}Ni_xFe_{12}O_{22}$ (x = 0, 0.25, 0.5, 0.75, 1) samples are prepared by solid-state reaction method and studied by x-ray diffraction (XRD), vibrating sample magnetometer (VSM), Mössbauer spectroscopy, and network analyzer for antenna characteristic. The XRD pattern is analyzed by Rietveld refinement method and confirmed the hexagonal with *R-3m*. The hysteresis curve shows ferrimagnetic behaviors at 295 K. Both saturation magnetization (M_S) and coercivity (H_C) are decreased with Ni contents. Ni^{2+}, which preferentially occupied the octahedral site with up spin sub-lattice, has smaller spin value S of 1 than Co^{2+} having S = 3/2. The ZFC measurement shows that Curie and spin transition temperature of the samples are found around 718 K and 210 K respectively. The Curie temperature T_C is increased with Ni contents, whilst T_S decreased with Ni. The Mössbauer spectra were measured at various temperatures and fitted by using a least-squares method with six sextet of six Lorentzian lines at below T_C. By Mössbauer spectroscopy, we confirmed the spin state of Fe ion to be Fe^{3+} and obtained the isomer shift, magnetic hyperfine field (H_{hf}), and the occupancy ratio of Fe ions at six sub-lattices. Based on this, we successfully determined that temperature dependent H_{hf} slope around 210 K, which is good agreement with the spin transition temperature obtained from ZFC analysis. The complex permeability and permittivity are measured between 100 MHz to 8 GHz, showing that sample is promising material for antenna devices in UHF band.

[1] Robert C. Pullar, Progress in Materials Science 57, 1191 (2012). [2] Y. Hiraoka, H. Nakamura, M. Soda, Y. Wakabayashi, and T. Kimura, J. Appl. Phys., 110, 033920 (2011).