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Magnetic properties of Co-doped BiFeO₃ nanoparticles

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In this study, we report the magnetic properties of BiFe_{1-x}Co_xO₃ nanoparticles (with $x = 0.05, 0.1, 0.2, 0.3$) synthesized by a simple solution method. The prepared samples were characterized by means of X-ray diffraction (XRD), scanning electron microscopy (SEM), and X-ray absorption spectroscopy (XAS). The crystallite size calculated by using the Debye–Scherer equation decreases with increasing Co doping content. The magnetic properties of the nanoparticles were measured by a vibrating sample magnetometer (VSM). The M-H loops of all BiFe_{1-x}Co_xO₃ nanoparticles exhibited ferromagnetic behavior at room temperature. The saturation magnetization (M_s) increased to be from 1.08 emu/g for BiFe_{0.95}Co_{0.05}O₃ to 8.26 emu/g for BiFe_{0.7}Co_{0.3}O₃. Co-doped BiFeO₃ nanoparticles with smaller crystallite size also caused to the enhancement of the coercivity (H_c) and squareness (Mr/M_s). The effect of Co doping on the structure and magnetic properties of BiFeO₃ nanoparticles is discussed.

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