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Synthesis and magnetic properties of $Zn_{1-x}Mn_xO/ZnO$ coaxial nanocabl. D. WANG, S. PARK, Y. LEE, T. EOM, Y. LEE, q-Psi and BK21 Program Division of Adanced Research and Education in Physics, Hanyang University, Seoul, Korea — $Zn_{1-x}Mn_xO/ZnO$ (x=0.04 and 0.20) coaxial nanocables were prepared by using an ultrahigh-vacuum radio-frequency magnetron sputtering system. The samples were characterized by scanning electron microscopy (SEM), x-ray diffraction (XRD), Rutherford backscattering and high-resolution transmission electron microscopy (HR-TEM), and with a superconducting quantum interference device magnetometer. The SEM images show that the morphology and the alignment of ZnO nanocables are maintained after the deposition of $Zn_{1-x}Mn_xO$ layer, and the thickness of $Zn_{1-x}Mn_xO$ layer is about 20 nm. The XRD analysis reveals that Mn is incorporated well into the wurtzite ZnO without forming Mn oxide. The HR-TEM image shows that both ZnO core layer and $Zn_{1-x}Mn_xO$ shell layer are single crystalline and an excellent epitaxial growth has been achieved. The magnetic property measurement indicates that the $Zn_{0.96}Mn_{0.04}O/ZnO$ coaxial nanocable is in the ferromagnetic state at 300 K as well as at 10 K, while $Zn_{0.80}Mn_{0.20}O/ZnO$ is nonferromagnetic even at 10 K and the bare ZnO nanorod is diamagnetic. The aging effect of the magnetism for $Zn_{0.96}Mn_{0.04}O/ZnO$ coaxial nanocable was also investigated, and it was found that the aged sample showed a mixed magnetic phase of ferromagnetism and paramagnetism.

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