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Fabrication and Control of Sodium Concentration in Cobaltate Na_xCoO_2 thin films ($x= 0.68, 0.75$) by Thermal Diffusion W.J. CHANG, Department of Electrophysics, National Chiao Tung University, J.-Y. LIN, Institute of Physics, National Chiao Tung University, C.H. HSU, National Synchrotron Radiation Research Center, Y.K. KUO, Department of Physics, National Dong Hua University, K.H. WU, T.M. UEN, Department of Electrophysics, National Chiao Tung University, H.L. LIU, Y.S. GOU, J.Y. JUANG, Department of Physics, National Taiwan Normal University — We have fabricated Na_xCoO_2 ($x \sim 0.68$ & 0.75) thin films on sapphire (0001) substrates via lateral diffusion of sodium into Co_3O_4 (111) epitaxial films. The environment of thermal diffusion is key to the control of the sodium content in thin films. From the results of x-ray diffraction and in-plane resistivity ρ_{ab} , the epitaxial growth and the sodium contents of these Na_xCoO_2 thin films were identified. The thermoelectric measurements show a large thermoelectric power in our films, similar to that of single crystals. The quasiparticle scattering rate is found to approach zero, consistent with the small residual resistivity, indicating high quality of the Na_xCoO_2 thin films.

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