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Thermoelectric Properties and Microstructure of $Ca_3Co_4O_9$ thin films on $SrTiO_3$ and Al_2O_3 Substrates[1] T. PAULAUSKAS, Q. QIAO, A. GULEC, R.F. KLIE, UIC, M. OZDEMIR, C. BOYRAZ, D. MAZUMDAR, A. GUPTA, UA — $Ca_3Co_4O_9$ (CCO), a misfit layered structure exhibiting large Seebeck coefficient at temperatures up to 1000K has attracted increasing attention as a novel high-temperature thermoelectric material. In this work, we investigate CCO thin films grown on $SrTiO_3$ (001) and Al_2O_3 (0001) using pulsed laser deposition. Quality of the thin films was examined using high-resolution transmission electron microscopy and thermoelectric transport measurements. HRTEM images show incommensurate stacks of CdI_2-type CoO_2 layer alternating with rock-salt-type Ca_2CoO_3 layer along the c-axis. Perovskite buffer layer about 10nm thick was found present between CCO and $SrTiO_3$ accompanied by higher density of stacking faults. The CCO grown on Al_2O_3 exhibited numerous misoriented grains and presence of Ca_xCoO_2 phase. Seebeck coefficient measurements yield an improvement for both samples compared to the bulk value. We suggest that thermoelectric properties of CCO increase due to additional phonon scattering at the stacking faults as well as at the film surfaces/interfaces.

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