Metal-insulator transitions in hole- and electron-doped Sm$_{1-x}$A$_x$NiO$_3$ thin films

P.-H. Xiang, 1AIST 2JST, CREST, H. Yamada, I.H. Inoue, A. Sawa, AIST, H. AkoH, 1AIST 2JST, CREST — We present a study of the transport properties of hole- and electron-doped Sm$_{1-x}$A$_x$NiO$_3$ (A = Ca$^{2+}$, Ce$^{4+}$, 0 ≤ x ≤ 0.1) thin films deposited on LaAlO$_3$(001) substrates by pulsed-laser deposition method. The temperature-driven metal-insulator (MI) transition of the Sm$_{1-x}$A$_x$NiO$_3$ films is progressively suppressed by either hole or electron doping. The Sm$_{1-x}$A$_x$NiO$_3$ (x = 0.1) films show metallic conductivity over measured temperature range (5-350K). The effect of hole doping on the MI transition has been investigated in detail. The MI transition temperature ($T_{MI}$) can be tuned around room temperature by 3% Ca doping. In addition, we observe an anomaly in the resistivity below $T_{MI}$, which may correspond to the Néel temperature ($T_N$) for SmNiO$_3$ system [1]. Based on the results of the transport properties, a possible phase diagram for the hole-doped Sm$_{1-x}$A$_x$NiO$_3$ thin films has been deduced.