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Gd-Doped $BaSnO_3$ Thin Films: High Mobility in a Magnetically-Doped Transparent Conducting Oxide[1] URUSA ALAAN, Stanford University, PADRAIC SHAFER, ALPHA N'DIAYE, ELKE ARENHOLZ, Lawrence Berkeley National Laboratory, YURI SUZUKI, Stanford University — It has recently been shown that when the perovskite-structure $BaSnO_3$ (BSO) is doped with $La_{Ba}{}'$, the result is a transparent conducting oxide with room-temperature electron mobilities that are much higher than conventional ternary oxides. The ability to achieve high carrier mobilities in BSO is promising for future perovskite-structure devices. We have used pulsed laser deposition to grow epitaxial thin films of $Ba_{0.96}Gd_{0.04}SnO_3$ (Gd:BSO) and $Ba_{0.96}La_{0.04}SnO_3$ (La:BSO) on (001) $SrTiO_3$ and (001) MgO substrates. At 300 K, Gd:BSO films have $\rho\sim$2 mΩ·cm, $\mu_e\sim$28 cm^2/V·s and n$\sim$1.0 $\times$ 10^{20}cm^{-3}. At the same temperature, La:BSO films have $\rho\sim$0.4 mΩ·cm, $\mu_e\sim$58 cm^2/V·s and n$\sim$2.5 $\times$ 10^{20} cm^{-3}. While La:BSO is diamagnetic, Gd:BSO is paramagnetic with a clear magnetic response that saturates at $\sim 7\mu_B/Gd^{3+}$, and a negative ordinary magnetoresistance at low temperatures. Like La:BSO, Gd:BSO is transparent and colorless in the visible regime. Thus, we have shown that Gd is good dopant for BSO in order to achieve transparency and metallicity that is coincident with a magnetic response.

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