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Anisotropic magnetic properties of Co-doped SnO_2 thin films[1]

JUN ZHANG, RALPH SKOMSKI, Dept. of Physics and Astronomy and Center for Materials Research and Analysis, Univ. of Nebraska-Lincoln, YONGFENG LU, Dept. of Electrical Engr. and Center for Materials Research and Analysis, Univ. of Nebraska-Lincoln, DAVID SELLMYER, Dept. of Physics and Astronomy and Center for Materials Research and Analysis, Univ. of Nebraska-Lincoln — There is strong interest in oxide magnetic semiconductors, which show not only room-temperature ferromagnetism (FM), but also other interesting magnetic properties. Large magnetic moments and anisotropic FM have been observed in Co-doped SnO_2 [1] and Co-doped ZnO [2], respectively. Here we report the preparation and magnetic properties of Co-doped SnO_2 ($Sn_{1-x}Co_xO_2$, x=0.05) thin films. $Sn_{1-x}Co_xO_2$ thin films were grown on different substrates by pulsed-laser deposition and characterized by X-ray diffraction and SQUID magnetometry, and their magnetic properties depend on the substrates on which the films are grown. Interestingly, the films grown on R-plane-cut Al_2O_3 show strongly anisotropic magnetic properties, with [101] being the easy axis. The anisotropy also depends on the substrate on which the films are grown. The results will be discussed in terms of spin-orbit coupling and crystalline defects. [1]. S. B. Ogale, et al., Phys. Rev. Lett. 91, 077205 (2003). [2]. M. Venkatesan, et al., Phys. Rev. Lett. 93, 77206 (2004).

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