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Magnetization hysteresis studies in $Sm_{1-x}Gd_xAl_2$ alloys U.V. VAIDYA, S. VENKATESH, V.C. RAKHECHA, DCMP&MS, Tata Institute of Fundamental Research, Mumbai, India, S. RAMAKRISHNAN, A.K. GROVER, DCMP&MS, Tata Institute of Fundamental Research, Mumbai, India — $SmAl_2$ ($T_c \sim 125$ K, $\mu_{sat}= 0.23\ \mu_B$/f.u.) is known to exhibit magnetic compensation when doped with Gd (< 3 at.%). In such stoichiometries though the magnetization gets closer to zero, there exists a large spin polarization. This makes such materials attractive candidates for applications. We have performed detailed magnetization hysteresis and other studies in the series $Sm_{1-x}Gd_xAl_2$. In x=0.02 alloy, the loops are shifted (notion of exchange bias) along negative H-axis for temperatures just above T_{comp} , and along positive H-axis for temperatures $T < T_{comp}$. We argue that the change in the sign of exchange bias is due to the magnetic contribution of conduction electron polarization as well as that of local magnetic moments reversing the signs. At T_{comp} the width of the hysteresis loop collapses. In the given series, one can set up the system in either spin-surplus or orbital-surplus state and control the exchange bias field. The compositions with $0.03 \leq x < 0.06$ do not exhibit zero cross over of magnetization and remain spin surplus. Our various studies and analysis shall be presented.

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