

Temperature induced Spin Reorientation Transition of V/Ni/Cu(001) thin films

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The phenomena of spin reorientation transition by an adlayer has been observed in various systems such as Pd/Fe, Pd/Co, Pt/Co, Pt/Ni, Fe/Ni, etc., with a great change of the orbital magnetic moment m_o . The enhancement was considered to be due to symmetry breaking at the interface but the estimated value is at least an order of magnitude smaller than the observed one. Further, the enhanced m_o did not fully account for the adlayer effect, and the interface magnetic anisotropy was simply attributed to a hybridization effect at the interface. In this work, we present results of comprehensive studies on the interface magnetic anisotropy induced by Vanadium adlayer (1 ML) on Ni/Cu(001) film using x-ray magnetic circular dichroism (XMCD) and x-ray absorption spectroscopy (XAS) at the Ni $L_{2,3}$ edges, and clarify its microscopic mechanism. The adlayer turns out to affect the magnetic hysteresis (M vs H) curve, and XMCD showed a great change of m_o at Ni. In the XAS spectrum, the intensity of the 6 eV satellite, which originates from a $3d^8$ configuration in the ground state, becomes enhanced with the adlayer, indicating Ni $3d$ to V $3d$ charge transfer. Meanwhile, we observed a considerable MCD signal at the V $L_{2,3}$ edges, which represents a magnetic moment of V $3d$ induced by strong V $3d$ -Ni $3d$ bonding at the interface.