

XMCD study at the Fe K and Ag L_{2,3} edge through a magnetic transition on Fe₅₀Ag₅₀ Thin Film

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Drastic variations of the thermal evolution of the Fe and Ag magnetic moments in Fe_xAg_{100-x} (50 ≤ x ≤ 55) thin films have been found and analyzed by means of DC magnetization, AC magnetic susceptibility and X-ray magnetic circular dichroism (XMCD) measurements at the Fe K-edge and Ag L_{2,3}-edges. The magnetic measurements reflect the presence of two different magnetic phases : a ferromagnetic Fe bcc nanoparticles and a FeAg interface that present a Curie temperature at 200K. Both phases are well observe with High Resolution Transmission Electron Microscopy. The FeAg interfase become paramagnetic at T>200K acting as a barrier for the exchange coupling between Fe nanoparticles. In order to explore the magnetic behaviour of the Fe and Ag atoms in this FeAg interface through the magnetic transition, we have performed an XMCD study at the Fe K-edge and Ag L_{2,3}-edges on a Fe₅₀Ag₅₀ thin film below (T = 175 K) and above (T = 320K) the magnetic transition (T = 200 K). XMCD measurements demonstrate the magnetic polarization of the Ag atoms being their induced moment ferromagnetically coupled to that of Fe ones. The relative variation of the Ag moment is twice as large as for the Fe moments through the transition, in agreement with a thermally dependent magnetic ordering/disordering of the Ag-rich FeAg interface to be responsible for this magnetic phase transition.

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