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Temperature-dependence x-ray magnetic circular dichroism in ultra thin film Fe on GaAs(001) at the Fe L_{2,3} edges
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Abstract Body: The magnetic properties of ultra thin epitaxial Fe films on GaAs(001) at initial few monolayers was investigated in the range from 10K to 299K(room temperature)by X-ray magnetic circular dichroism (XMCD). Remarkable ferromagnetic regime was sensitive to changing of a Curie temperature. We found a T_C of a nominal thickness 0.4nm lower to around 150K and the ferromagnetism vanished at room temperature. With Fe thickness up to 1.25nm, the magnetization curve kept on to room temperature and it showed a T_C above RT. The magnetic moment and orbital moment as well as their ratio have been calculated using sum rules from XMCD spectra. The magnetic moment of 0.4nm Fe at 10K is 1.8μB nearly equal to the bulk Fe 1.98μB. All these data strongly imply ultra thin Fe films on GaAs(001) maybe exhibit ferromagnetic properties at the initial stage of epitaxy, the reasons for vanishing of magnetization at room temperature were not dead layer or superparamagnetism , it came from a lower curie temperature than RT caused by a weaker exchange interaction in the films.

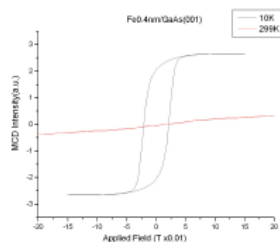
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The XMCD intensity for 0.4nm thin Fe on GaAs(001) at 10K and 299K

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