

Inhomogeneous Magnetic Phase Transition in Fe/Gd Multilayers*

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The low-field surface nucleation and evolution of the inhomogeneous magnetic state in strongly coupled Fe/Gd ferromagnetic multilayers is measured via grazing-incidence X-ray magnetic circular dichroism. At $T = 0.7 T_0$, where $T_0 = 110$ K is the ferromagnetic compensation temperature, the inhomogeneous state nucleates at the surface. At nucleation, the surface state extends tens of interatomic distances into the bulk (~ 200 Å), a direct consequence of the strong interlayer coupling. At $T \sim T_0$, the inhomogeneous state penetrates throughout the bulk, while homogeneous magnetic states occur far below and above T_0 . Surface termination has a dramatic effect on the nature of the inhomogeneous state.

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