Monolayer magnetism tuned by interlayer exchange coupling

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We investigated changes of the magnetic properties of a single Fe monolayer on Au(001), induced by the interlayer exchange coupling to FeAu monoatomic superlattices. The method used was Grazing Incidence Nuclear Resonant Scattering of X-rays (GI-NRS). The

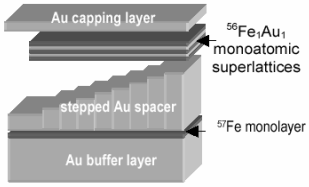

Fig.1a The layers configuration of the measured system is schematically shown.

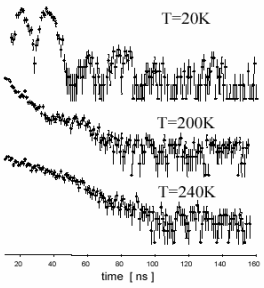

Fig.1b GI-NRS time-spectra collected for the uncoupled ^{57}Fe monolayer at 20K, 200K, 240K

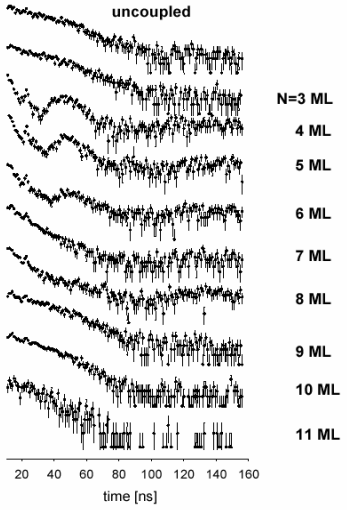

Fig.2 GI-NRS time-spectra collected for the system shown in Fig.1a taken at 240 K as the function of the Au spacer thickness N (in monolayers)

studied system is shown in the Fig. 1a. The time-spectra measured at different temperatures for the uncoupled Fe monolayer region are shown on the Fig. 1b. The spectra accumulated above 200K are of paramagnetic character what is related to the Curie temperature of the system $T_c \approx 200$ K, in perfect agreement with previous MOKE results. Below T_c quantum beats are visible indicating existence of the ferromagnetic order. The time-spectra accumulated at 240 K for the different N are shown in Fig. 2. The top most spectrum represents the uncoupled Fe monolayer region. It can be clearly seen that quantum beats appear in the spectrum measured for the Fe monolayer region spaced from the top FeAu superlattice by the 4 ML Au spacer. At the Au thickness of 7ML the beats disappear again and then seem to change their character again at N = 9 and N = 11. The origin of this behavior is the interlayer exchange coupling, since the structure of the system is unaffected.

[1] N. Spiridis, J. Korecki, Appl. Surf. Science **141** (1999) 313.

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