IMPORTANCE OF SPIN FLUCTUATIONS IN COUPLED TWO-DIMENSIONAL MAGNETIC TRILAYERS

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Two ultrathin ferromagnetic films of Co and Ni separated by a non-magnetic spacer of Cu are taken to study the spin-spin correlations of weakly coupled ferromagnets. The Ni film thickness ranging between \( d_{\text{Ni}} = 2 - 6 \) monolayers (ML) is chosen to study the \( 2D \rightarrow 3D \) dimensional crossover in ferromagnets. X-ray magnetic circular dichroism is the ideal technique to study the temperature dependence of the magnetization of Co and Ni separately. The spacer thickness ranges from \( d_{\text{Cu}} = 2 - 8 \) ML to monitor the oscillatory behavior of the interlayer exchange coupling. The measured temperature-dependent magnetizations and the corresponding Curie temperatures are accompanied by a microscopic many-body Green’s function theory. Both experiment and theory give firm evidence that for nanostructured magnets a static mean field description is insufficient. It is demonstrated that higher order spin-spin correlations are important and explain the observed increase of the Curie temperature by up to \( \sim 200\% \) due to the interlayer exchange coupling. The results are visualized in a three-dimensional diagram for the first time as a function of both the Ni thickness and the Cu spacer thickness. Supported by BMBF (05 KS4 KEB/5) and DFG (Sfb 290, TP A2).

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