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 $d_{Ni} = 2 - 6$ 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 $d_{Cu} = 2 - 8$ 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 ~ 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.
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9.7 cm

13.4 cm

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