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Design of Co/Pd multilayer system with antiferromagnetic-to-ferromagnetic phase transition

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Among the known magnetic material systems there are only very few examples of materials that undergo a temperature dependent antiferromagnetic-to-ferromagnetic phase transition, and of these only the chemically ordered alloy FeRh exhibits this transition near room temperature [1, 2]. Here we present a perpendicular anisotropy multilayer structure that mimics FeRh. The basic idea is to use two stacks of Co/Pd multilayers with large perpendicular magnetic anisotropy and high Curie temperature, T_C, separated by a layer providing antiferromagnetic coupling, and a CoNi/Pd multilayer with perpendicular anisotropy with a lower T_C, interlayer, in the range of the desired AF-FM transition temperature, T_{AF-FM}. At room temperature this system behaves as two antiferromagnetically coupled layers with a low perpendicular remanent magnetic moment. As the temperature is raised to approach $T_{C,\,interlayer}$ the magnetization of the interlayer is gradually reduced to zero, and consequently its coupling strength is reduced. Eventually, the effective coupling between the two high-K_U, high-T_C layers becomes dominated by their dipolar fields, resulting in a parallel alignment of their moments and a net remanent magnetic moment equal to the sum of the moments of the two high-T_C layers [2].

[1] J. S. Kouvel and C. C. Hartelius, J. Appl. Phys. **33** (1962) p1343
[2] J.-U. Thiele, E. E. Fullerton, S. Maat, Appl. Phys. Lett. **82** (2003) p2859
[3] J.-U. Thiele. T. Hauet. O. Hellwig, Appl. Phys. Lett. **92** (2008) 242502.