



Synthesis and characterization of hematite-ilmenite multilayers: preliminary results

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The experimental investigation of "lamellar" magnetism in the hematite-ilmenite system so far has been limited to natural nanoscale exsolutions. To study systematically the effect of lamella thickness on the magnetic properties of the system, we have grown thin films of hematite with and without intercalated Ti-oxide monolayers on various substrates. The films were characterized in situ (X-ray diffraction, Auger-spectroscopy) and ex situ (Raman spectroscopy, atomic-force microscopy, magnetic bulk measurement techniques).

It turns out that already a Ti-oxide monolayer in a hematite film dramatically changes the magnetic properties of hematite. Such a hematite - Ti-oxide - hematite sandwich is ten-times more magnetic compared to a pure hematite thin film, which cannot be explained by the properties of the individual phases and clearly shows that a new magnetic phase emerges in the contact layer. Importantly, the coercive field rises from 15 mT at room temperature to 88 mT at 10 K after field cooling. This coercivity enhancement, in combination with a small exchange bias of 3 mT, points to exchange coupling between ferrimagnetic and antiferromagnetic layer.