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Complementary neutron/synchrotron study of structure and magnetism of rare earth/transition metal multilayers

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Magnetic nanostructures containing thin layers of ferromagnetic and nonmagnetic metals are of considerable interest both for fundamental physics and as potential elements for spintronic devices. Exchange coupling of magnetic nanolayers separated by paramagnetic spacers is relatively well studied for purely rare earth (RE) systems or purely transition metal (TM) ones but little is known about interlayer exchange coupling RM and TM magnetic metals through paramagnets.

In this work we report results of neutron/X-ray combined study of several RE/TM systems as Fe/Pd/Gd, Dy/Co, Dy/Gd etc. Systems were grown with UHV sputtering, good layered structure was confirmed with X-ray reflectometry. By combining neutron and resonant X-ray reflectometry we found rich phase diagram of RE/TM heterostructures which arising due to the competition of exchange coupling, magneto crystalline anisotropy and Zeeman energy. The research was partly supported by RFBR under Grant No. 18-32-00197.

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