# Ferri-/Antiferromagnetic Heterostructures: a case study of $Fe_3O_4$/NiO interface

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During the past decade's most of the spintronic applications relied on the manipulation of magnetic moments in ferro- (FM) or ferrimagnets, with antiferromagnets (AFM) acting as passive elements only, for example as pinning layers in spin valves. Due to the large potential for downscaling and low power consumption, antiferromagnets are promising candidates for the next generation of spintronic devices. One of the ways to control the AFM domain arrangement is the interfacial coupling to a neighboring ferromagnet. In our approach we will take the advantage of the exchange coupling strength at the interface of an epitaxial AFM/Ferrimagnetic bilayer.

The target of our research consists of the prototypical room-temperature antiferromagnet NiO, epitaxially grown on $Fe_3O_4$(111)/Ru(0001). The samples were grown by using high-temperature oxygen-assisted molecular beam epitaxy method (HOMBE) on a Ru single crystal. A comprehensive characterization is performed combining LEEM and LEED for structural characterization and PEEM (PhotoEmission Electron Microscopy) with synchrotron radiation for chemical and magnetic analysis via X-ray Absorption Spectroscopy and X-ray Magnetic Linear Dichroism (XAS-PEEM and XMLD-PEEM, respectively). While bulk NiO is antiferromagnetic and produces no circular dichroism due to the vanishing net moment, this is not necessarily true for the $Fe_3O_4$/NiO interface. Hereby we determine the spin axis orientation of NiO with nanometer spatial resolution and by comparing it with $Fe_3O_4$ ferrimagnetic domain distribution we provide insight into their coupling.

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