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Resonant elastic x-ray scattering studies of magnetism in nickelate heterostructures¹

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Perovskite rare-earth nickelates exhibit an unusual period-four antiferromagnetic order. The realization of collinear and non-collinear spin structures and a different amplitude of magnetic moments on alternating nickel sublattices have been subjects of debate for decades. In my talk, I will present results of our resonant x-ray scattering studies on different nickelate-based heterostructures. In combination with density functional theory calculations and a local many-body model we showed that both, collinear and non-collinear magnetic states can be realized in thin NdNiO₃ layers if the interaction between neighboring magnetic sites is truncated along the [111] pseudocubic direction. Furthermore the relative size of nickel magnetic moments in the antiferromagnetic sublattices is determined by the crystallographic symmetry of the confining layers. In a second study we focused on the magnetic exchange interaction between rare-earth and transition-metal ions in epitaxial LaNiO₃-DyScO₃ superlattices and observed induced collinear magnetic order in interfacial Dy moments with the same periodicity as in LaNiO₃. The results give new, important insight to the relevant interactions stabilizing the magnetic order in nickelates and open up new perspectives for their selective manipulation.

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