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EINLADUNG zum IFP-SEMINAR

Metal-Insulator Transition and Interlayer Coupling in Nickelate-based Heterostructures

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Host:	Karsten Held
Termin:	Mittwoch, 2. März 2016, 16 Uhr
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In recent years, complex-oxide heterostructures have garnered much attention due to the many routes (strain, interfacial interactions, reduced dimensionality, etc.) they offer for further tuning the already outstanding properties of these materials and also allowing novel functionalities to be engineered.
In this presentation, we will focus on nickelate thin films and heterostructures. Perovskite nickelates ($RNiO_3$, *R*=rare earth), with the exception of $LaNiO_3$, display a bandwidth-controlled metal insulator transition (MIT) and antiferromagnetic order in the low temperature phase [1]. Tuning of the MI and Néel transitions is efficiently achieved in nickelate thin films over a wide temperature range [2, 3], and even ultrathin $LaNiO_3$ films undergo a MIT as the thickness is reduced [4, 5]. We will also report how interface engineering can be used not only to induce a new magnetic phase in an otherwise non-magnetic material but also to generate rich and complex magnetic behaviour in (111)-oriented $LaNiO_3/LaMnO_3$ heterostructures [6, 7]. For 7-monolayer-thick $LaNiO_3/LaMnO_3$ superlattices, the emergence of negative and positive exchange bias is observed at low temperature before the stabilization of an antiferromagnetically coupled state between the $LaMnO_3$ layers above the blocking temperature. This behaviour is explained by the onset of an antiferromagnetic spiral of (1/4,1/4,1/4) wave vector in the ultrathin $LaNiO_3$ layer. Influence of the degree of intermixing at the monolayer scale on the interface-driven properties will also be discussed [8].

[1] Medarde, *J. Phys.-Condens. Mat*, **9**, 1679 (1997).
[2] Catalano *et al.*, *APL Mater.* **3**, 062506 (2015).
[3] Catalano *et al.*, *APL Mater.* **2**, 116110 (2014).
[4] Scherwitzl *et al.*, *Appl. Phys. Lett.* **95**, 222114 (2009).
[5] Scherwitzl *et al.*, *Phys. Rev. Lett.* **106**, 246403 (2011).
[6] Gibert *et al.*, *Nat. Mater.* 11, **195** (2012).
[7] Gibert *et al.*, *Nat. Commun.* (in press).
[8] Gibert *et al.*, *Nano Letters* **15**, 7355 (2015).