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Studying the evolution of the metallic state in LaNiO_3 from a single crystal to superlattices with β -detected NMR

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The rare-earth nickelates (RNiO_3) are a prototypical example of a metal-insulator transition. Among the RNiO_3 , LaNiO_3 is unique in remaining metallic, although highly correlated. Interestingly, superlattices with insulating interlayers of LaAlO_3 , can be driven insulating and antiferromagnetic if they are thin enough¹. We have used ^8Li β -detected NMR (β -NMR), to study LaNiO_3 as a single crystal, thin film, and in superlattices with LaAlO_3 . We observe biexponential spin-lattice relaxation which we attribute to electronic phase separation^{2,3}. In the single crystal and bulk-like thin film, both phases appear metallic². However, in the ultrathin layers of the superlattices, the behaviour of one of the phases appears magnetic at low temperature³.

1. A. V. Boris et al., Science 332, 937 (2011)
2. V. L. Karner et al., Phys. Rev. B 100, 165109 (2019)
3. V. L. Karner et al., Phys. Rev. B. 104, 205114 (2021)

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