Studying the evolution of the metallic state of $LaNiO_3$ from a single crystal to superlattices using ^{8}Li β-detected NMR

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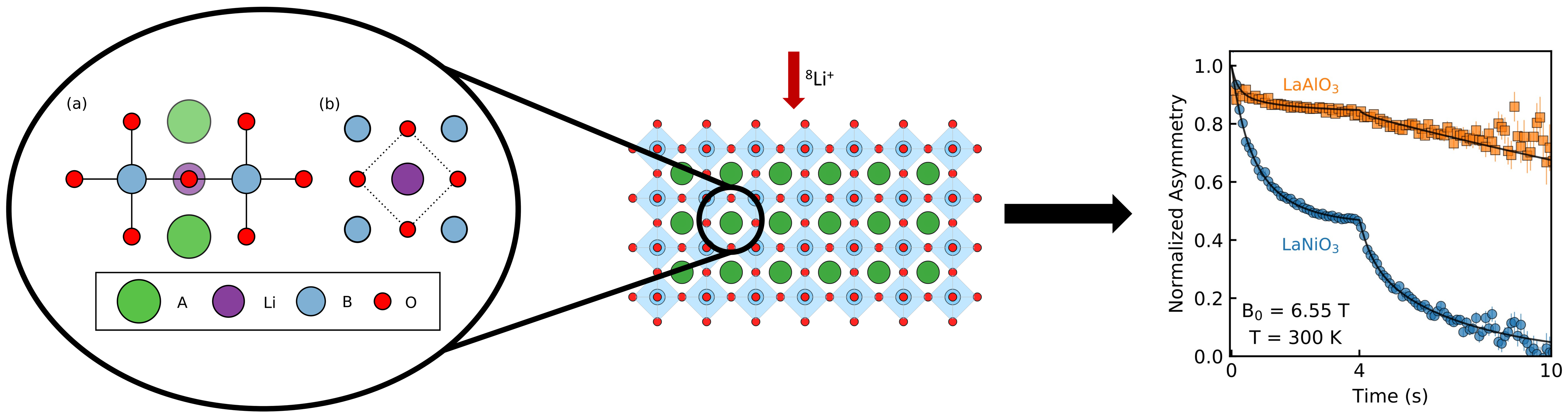
Summary

- The metallic state of $LaNiO_3$ appears inhomogeneous or phase separated even in the bulk
- In the single crystal and thick films, both phases are metallic
- In the superlattices, the slow component appears to remain metallic even for 2 u.c. thick $LaNiO_3$
- In contrast, the fast component is much more sensitive to confinement.



Spin-lattice relaxation ($1/T_1$) of an implanted NMR probe

^{8}Li in bulk $LaNiO_3$

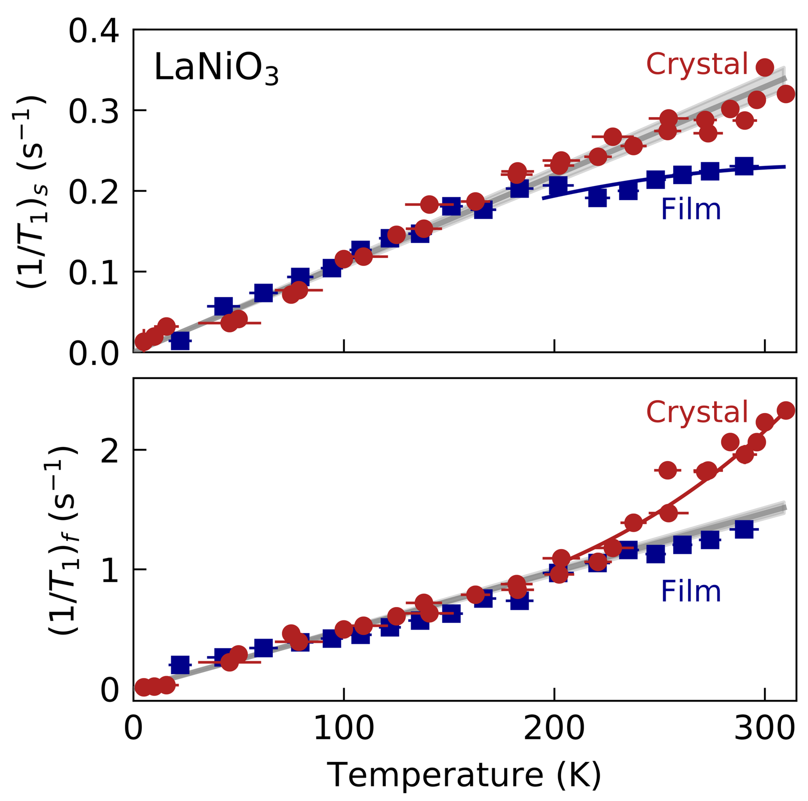
In the crystal and a 40 nm thick film, the metallic character is demonstrated by the Korringa linear T dependence.

But surprisingly, there appear two equally abundant metallic environments.

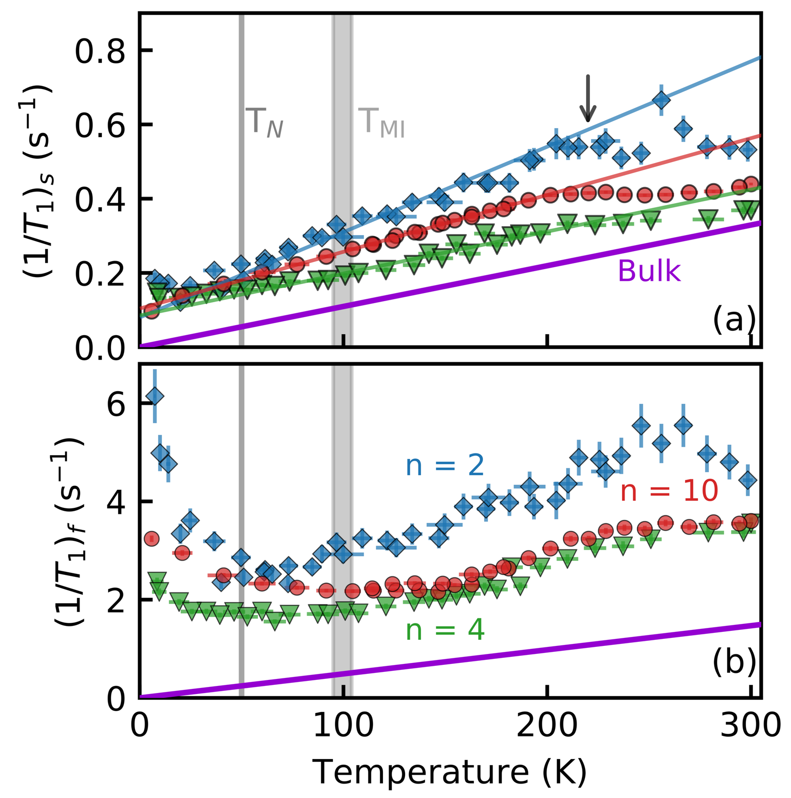
The normalized Korringa product obtained from combining the Knight shift and the Korringa slope of the slow component:

$$K = \frac{T_1 T K^2}{S} = 0.40 \pm 0.10$$

where $S = 1.20\times10^{-5}\ s\,K$ for ^{8}Li. Here, $K \ll 1$, indicating substantial antiferromagnetic correlations.



^{8}Li in $LaNiO_3/LaAlO_3$ superlattices



The two environments found in the bulk respond differently to the constraint of finite thickness in superlattices.

The fast component becomes non-metallic and the low T upturn is reflective of a magnetic ground state, while the slow component remains metallic with little perturbation.

To read more, see:

Acknowledgements

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To read more, see:

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