PLD growth & reduction results on infinite layer nickelates superconducting films

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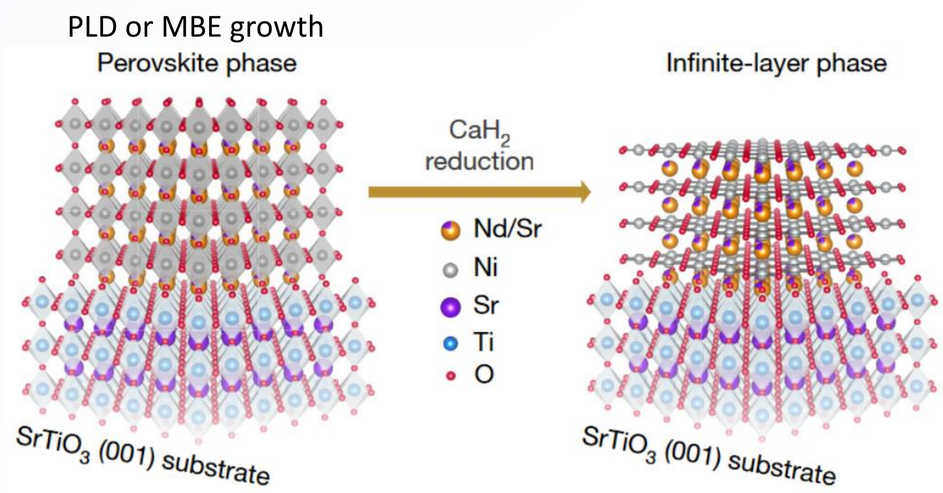
Background: new unconventional superconductor family with exotic behaviors

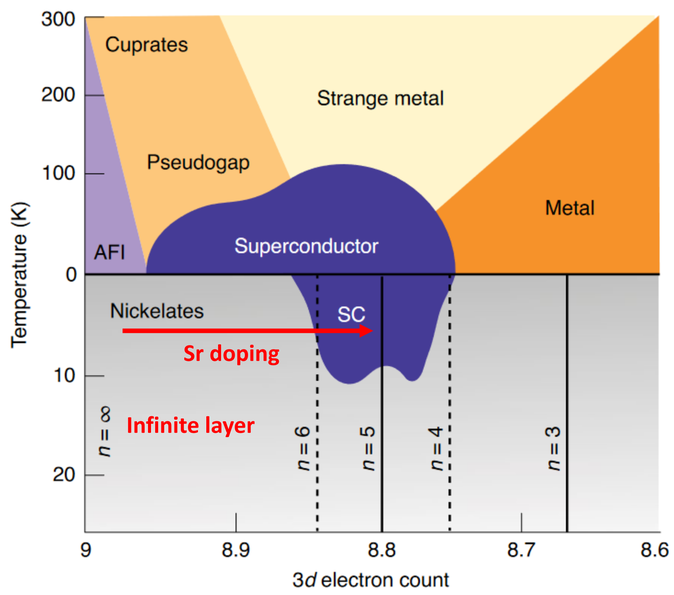
Preparation of $Nd_{0.8}Sr_{0.2}NiO_2$



Phys. Rev. Lett., 2020, 125: 147003.

❖ **Other infinite layer nickelate films report superconductivity: $Pr_{0.8}Sr_{0.2}NiO_2$, $La_{0.8}Sr_{0.2}NiO_2$, $La_{0.8}Ca_{0.2}NiO_2$ …**

Similar electron configuration with optimal doped cuprate superconductors



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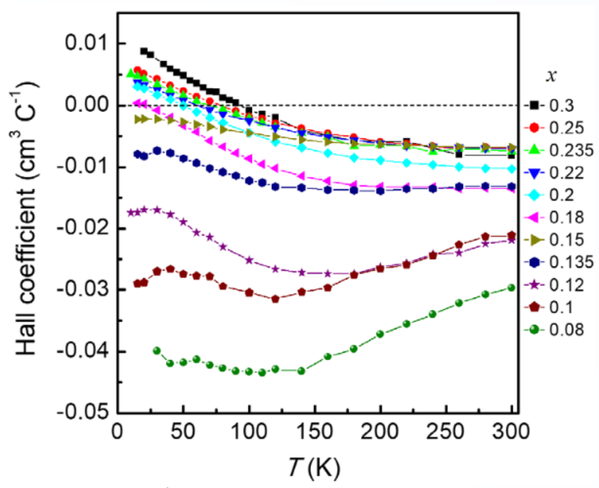
Multi-band behavior



Phys. Rev. Lett., 2020, 125: 147003.

Motivation

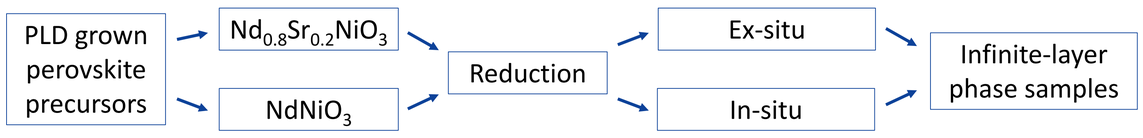
❖ **Possible new clues to unveil the pairing mechanism of unconventional superconductors.**

❖ **Still lack electronic structure studying!**

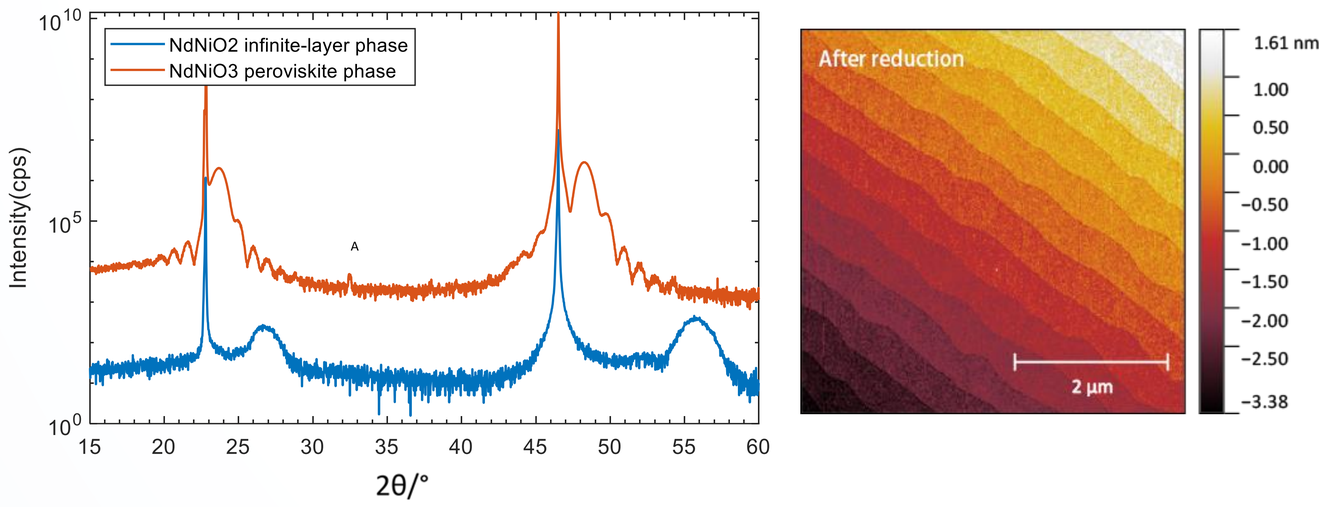
❖ **In-situ reduction is needed for ARPES measurement!**

Experiments

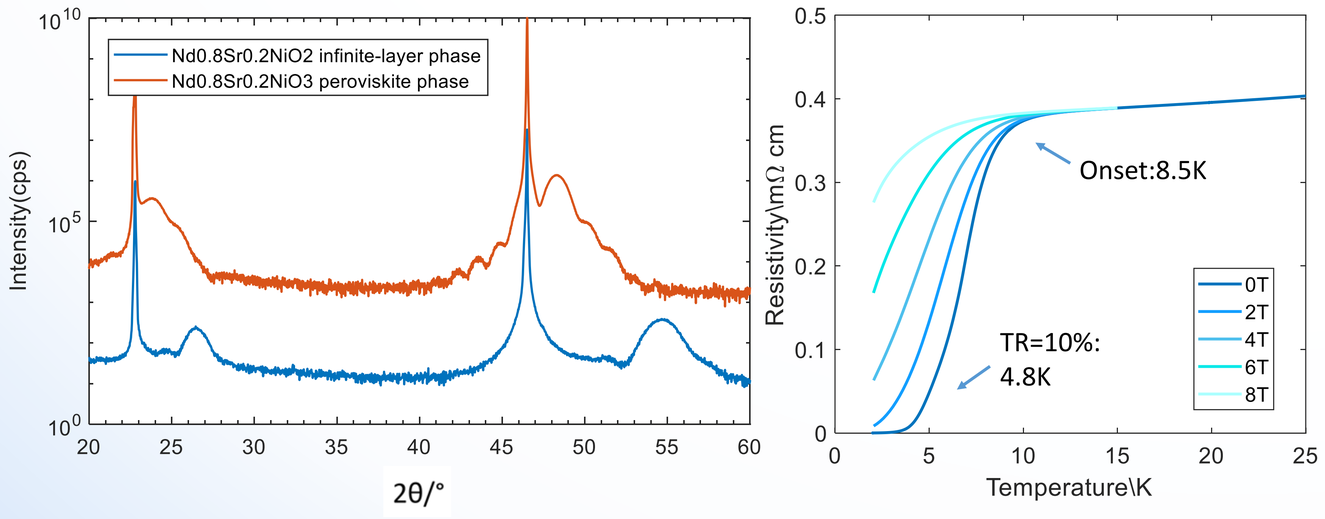
Experiment routine



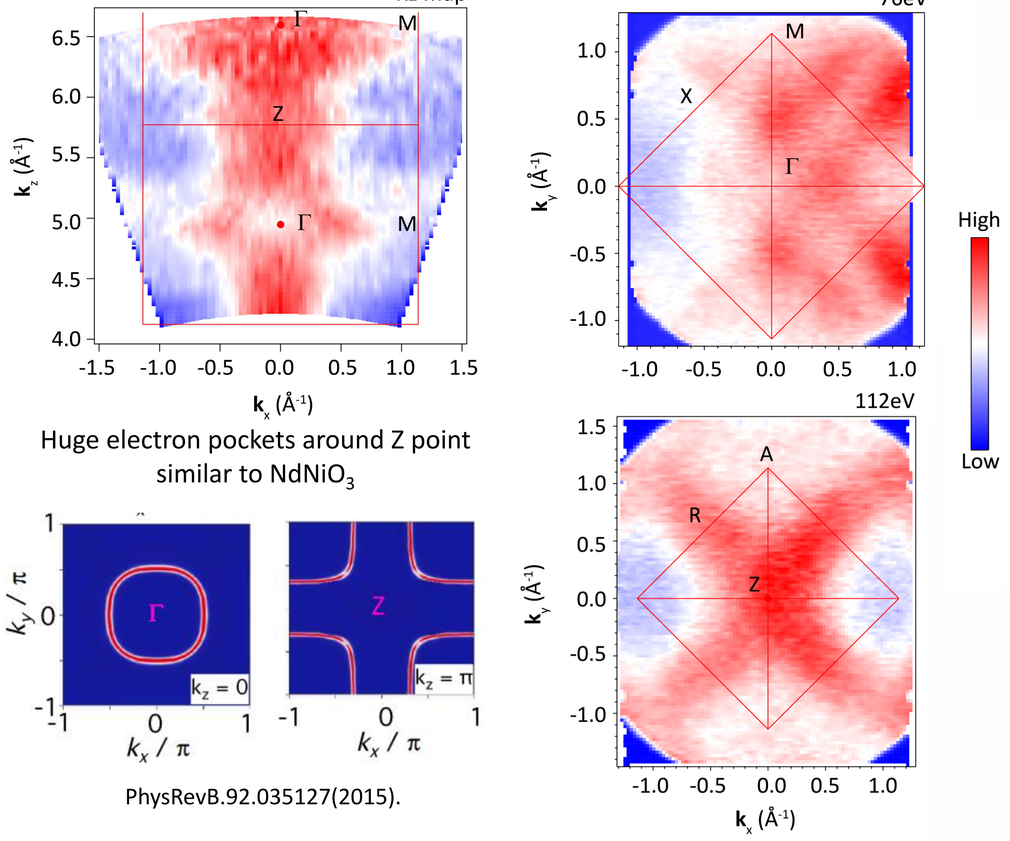
$NdNiO_3$ precursors and reduced $NdNiO_2$ in good crystalline quality



Ex-situ reduced $Nd_{0.8}Sr_{0.2}NiO_2$ show superconductivity



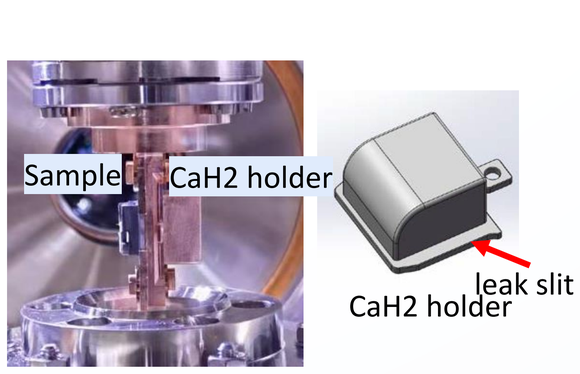
Electronic structure of $Nd_{0.8}Sr_{0.2}NiO_3$ precursors



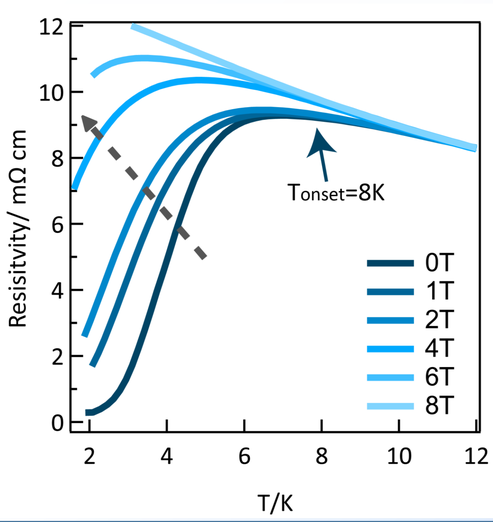
Huge electron pockets around Z point similar to $NdNiO_3$

PhysRevB.92.035127(2015).

In-situ reduced $Nd_{0.8}Sr_{0.2}NiO_2$ show superconducting signal



In-situ annealing chamber



Conclusions & outlook

❖ **High quality nickelate precursors $NdNiO_3$ and $Nd_{0.8}Sr_{0.2}NiO_3$ are grown by PLD.**

❖ **After ex-situ reduction, $Nd_{0.8}Sr_{0.2}NiO_2$ show superconductivity.**

❖ **After in-situ reduction, $Nd_{0.8}Sr_{0.2}NiO_2$ show superconducting signal.**

❖ **In-situ reduction method needs further development to fulfill the demand in electronic structure measurement.**