“Low-Dimensional Quantum Materials Design Through Atomically Precise Film Synthesis”

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Engineering E203

Abstract

Low-dimensional quantum materials are at the forefront of scientific exploration due to their extraordinary electronic and magnetic characteristics, distinct from those observed in bulk systems. Among the various synthesis techniques, Molecular -beam epitaxy (MBE) emerges as a leading method for developing these innovative materials. This advanced thin-film deposition approach allows for the precise engineering of quantum materials, unlocking remarkable properties such as superconductivity, quantum magnetism, and topological order. In this talk, I will discuss leveraging MBE along with characterization tools such as angle-resolved photoemission spectroscopy (ARPES) and resonant x-ray scattering (RXS), to successfully introduce a completely new antiferromagnetic (AFM) metal phase in transition metal oxide nickelate. Additionally, I will cover the exploration of the superconductivity within nickelates and iron-based chalcogenide. I will also share my vision and effort in pushing the boundaries of the MBE technique to further explore novel low-dimensional quantum materials.

Biography

Qi Song is currently a postdoctoral scholar in the Department of Material Science and Engineering at Cornell University. She earned her Ph.D. in Physics from Fudan University in China, and then spent two years as a Postdoc Scholar at Harvard University before joining Cornell. Her research is centered around the exploration of low-dimensional quantum materials through molecular beam epitaxy (MBE) assisted by spectroscopy characterization.