



Weekly Seminar

Resonant X-ray Scattering Study of Square-Planar Low-Valence Nickelates

Yao Shen

The Institute of Physics, Chinese Academy of Sciences



Time: 3:00 pm, May. 29, 2024 (Wednesday)

时间: 2024年5月29日 (周三) 下午3:00

Venue: Room w563, Physics building, Peking University

地点: 北京大学物理楼, 西563会议室

直播链接: <https://www.koushare.com/live/details/34768>

Abstract

The discovery of superconductivity in square-planar low-valence nickelates has ignited a vigorous debate regarding their essential electronic properties: Do these materials have appreciable oxygen charge-transfer character and super-exchange akin to the cuprates or are they in a distinct Mott-Hubbard regime where oxygen plays a minimal role and super-exchange is negligible? Do they host charge order as cuprates and what is the electronic character of this symmetry breaking? Here, we resolve these questions using state-of-the-art resonant x-ray scattering measurements of the over-doped low-valence nickelates $R_4Ni_3O_8$ ($R=La, Pr$) and benchmark our results against a prototypical cuprate $La_{2-x}Sr_xCuO_4$ ($x=0.35$), which has a similar effective doping. We will discuss in detail their electronic structure, charge instability, magnetic interactions, plasmon behaviors, and electron-phonon coupling characters. By doing so, we are able to clarify the essential characteristics of low-valence nickelates and put strong constraints on theoretical interpretations of superconductivity in these materials.

About the speaker

Yao Shen received his B.S. and Ph.D. from Fudan University in 2013 and 2019, respectively, and worked as a postdoctoral research associate at Brookhaven National Laboratory in US afterwards. He joined the Institute of Physics, Chinese Academy of Sciences in 2023 as an associate professor. His research focuses on understanding the novel physical properties, and collective electronic and magnetic behaviors in various quantum materials using combined neutron and x-ray scattering techniques. So far, he has published more than 30 SCI papers including 1 Nature, 2 Nat. Commun., 2 PRX, and 2 PRL as a first author, and 2 Nat. Commun. and 1 PRL as a co-first author.

