THE CHINESE UNIVERSITY OF HONG KONG
Department of Physics
SEMINAR

High-temperature Superconductivity: Rare or Ubiquitous?

by

Dr. Lin Er CHOW
Quantum Materials by Design
National University of Singapore

Date: January 16, 2025 (Thursday)
Time: 10:30 - 11:30 a.m.
Place: Rm G26, Science Centre North Block, CUHK

ALL INTERESTED ARE WELCOME
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Abstract

The 1987's Nobel Prize in Physics celebrated the discovery of superconducting copper oxides (ceramics) with a transition temperature above the 30 Kelvin range. The year 1987 marked the beginning of 'high-T_c' superconductivity which a diverse family of copper oxides discovered with 'intrinsic' high-T_c superconductivity without the need for external pressure, strain, or field modulation. In the following few decades, a broad class of oxide-based layered superconductors are investigated, including but not limited to the Ti-, Bi-, Ru-, Co-, Ni- based layered oxides. However, 'intrinsic' high-T_c superconductivity above the 30 Kelvin range has never been observed in another oxide without copper. The unfathomable uniqueness of copper in the electron pairing mechanism has therefore been a longstanding mystery in condensed matter physics. "Is high-T_c unconventional superconductivity unique to copper?"

Here, I propose and demonstrate that (1) superconductivity is common among the periodic table of elements; (2) a model to increase the energy scale of superconductivity (T_c) in a general layered system. Therefore, the logical implication is "high-T_c superconductivity is ubiquitous". Following this proposition, we made the first demonstration in a layered nickel oxide which high-T_c superconductivity is observed without the need for external modulation.

Enquiries: 3943 6303