



हिमाचल प्रदेश केंद्रीय विश्वविद्यालय
(NAAC-Accredited : A⁺ with CGPA of 3.42)
आन्तरिक गुणवत्ता आश्वासन प्रकोष्ठ
धर्मशाला, जिला कांगड़ा, हि.प्र.- 176215



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dated: 03.04.2025

Event Report

Name of the Event	Colloquium Talk on Emerging Phenomenon In Freestanding Complex Oxides and 2D Thin Films: From Quantum Materials to Functional Nanoarchitecture
Objective of the event	To introduce participants to cutting-edge research in the field of freestanding complex oxide and 2D thin film materials. To enhance understanding of emerging quantum phenomena, such as phase transitions, superelasticity, magnetoelectric coupling, and correlated electron behavior.
Date, Time and Venue	April 3, 2025 (Thursday), 12:30 P.M.
Convener / Organising Secretary	Prof. Rajesh Kumar Dr. Pawan Heera
Organising Unit	Department of Physics and Astronomical Science
Participants	30 participants consisting of Ph.D scholars, and PG students of the departments were present.
Outcome of the event	Participants gained comprehensive knowledge of the latest developments in freestanding oxide thin films and their applications in quantum materials and nanoelectronics.
Expenditure & Funding Agency if anyone otherwise CUHP	CUHP
Photos (at least one geo-tag)	



Dr. Rahul, Postdoctoral Research Fellow, National Cheng Kung University, Taiwan, delivering a talk on "Emerging Phenomena in Freestanding Complex Oxide & 2D Thin Films" during the seminar organized by the Department of Physics and Astronomical Sciences on April 3, 2025.

Event Report

Title of the Event:

Seminar on "Emerging Phenomena in Freestanding Complex Oxide & 2D Thin Films: From Quantum Materials to Functional Nanoarchitectures"

About the Speaker:

Dr. Rahul is a Postdoctoral Research Fellow at National Cheng Kung University, Taiwan. His research focuses on quantum materials, 2D thin films, and functional nanoarchitectures, with several international publications in high-impact journals. His expertise lies in fabrication and characterization of complex oxide systems, and he has made significant contributions to the field of emerging electronic and magnetic materials.

The seminar delved into the latest advancements in freestanding complex oxide thin films and 2D materials, highlighting their potential for integration into next-generation quantum and nanoelectronic technologies.

Dr. Rahul discussed phenomena such as delocalized electron behavior, unconventional phase transitions, superelasticity, and magnetoelectric coupling in ultrathin film systems. He elaborated on the integration of freestanding oxides with 2D transition metal dichalcogenides (TMDs) as a strategy to enhance device performance, addressing issues of leakage current and interface quality.

The session also covered Twistronics and Moirétronics, emerging research areas focusing on strongly correlated properties in twisted multilayer structures. The talk concluded with insights into fabrication of artificial van der Waals structures derived from non-layered oxides, paving the way for innovative device architectures in quantum

computing

and

nanoelectronics.

The session was highly engaging, with active participation from 25 students and faculty members who interacted with the speaker during the Q&A session.

(Sig.) <i>Prof. Rajesh Kumar</i> Convener	विभागाध्यक्ष, भौतिकी एवं खगोल विज्ञान विभाग Head, Department of Physics & Astronomical Science (Sig.) Central University of Himachal Pradesh शाहपुर परिसर, शाहपुर / शाहपुर (हि.प्र.) / Shahpur (H.P.) Head/Director (With Stamp)
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1. Program brochure



क्राइल सं.: PAS-2.2(Workshop/Seminar)/CUHP/24/01

हिमाचल प्रदेश केंद्रीय विश्वविद्यालय

Central University of Himachal Pradesh

(Accredited by NAAC with 'A+' Grade with CGPA of 3.42)

(भौतिकी एवं खगोल विज्ञान विभाग)

(Department of Physics and Astronomical Science)

दिनांक 01.04.2025

Colloquium Talk

Emerging Phenomena in Freestanding Complex Oxide & 2D Thin Films: From Quantum Materials to Functional Nanoarchitectures

Speaker: Rahul, Ph.D
Postdoctoral Research Fellow
Department of Physics & QFort
National Cheng Kung University, Taiwan



Date & Time: April 3, 2025 (Thursday), 12:30 P.M.
Venue: Seminar Hall, Shahpur Parisar, Department of Physics and Astronomical Science, Central University of Himachal Pradesh.

Abstract: The flourishing development of freestanding complex oxide thin films has opened exciting avenues for discovering novel quantum materials and seamlessly integrating multifunctional oxides into advanced technological applications. These materials exhibit remarkable emerging phenomena, including delocalized electron behavior, unconventional phase transitions in ultrathin films down to the single-unit-cell limit, super-elasticity, flexibility, and magnetoelectric coupling. Beyond their intrinsic properties, the integration of freestanding oxides with 2D transition metal dichalcogenides (TMDs) in CMOS-compatible devices presents a promising strategy to address key challenges, such as leakage currents and interface quality, ultimately enhancing the performance of modern electronic devices.

This talk will provide an overview of the latest advances in freestanding complex oxides, with a particular focus on their integration with 2D nanoelectronics and functional nanoarchitectures. Special attention will be given to strategies for tailoring strongly correlated properties in stacked and twisted hetero-homostructures, where diverse order parameters and lattice geometries play a pivotal role. Additionally, I will discuss recent breakthroughs in the fabrication of artificial van der Waals structures derived from non-layered 3D oxides, offering new perspectives on emergent quantum phenomena in Twistrionics and Moirétronic devices. By unveiling novel electronic, magnetic, and structural properties, these efforts pave the way for the next generation of oxide-based quantum and nano electronic technologies.

Convener

Prof. Rajesh Kumar
Prof. & Head
Department of Physics & Astronomical Science, Central University, H.P.

