17th TcSUH STUDENT/POSTDOC SEMINAR

Monday, February 27, 2023 - 5:00 pm, HSC 102

or join by Zoom:

(Meeting ID: 263 324 2787): https://tinyurl.com/2p9de9zh

Meet & Greet: Food and soft drinks will be served at **4:30** *p.m!! (RSVP)*

Flexible, Nonmetallic Substrate Buffer Architecture for REBCO Films for High-Frequency Applications

Jithin Sai Sandra

TcSUH and Department of Mechanical Engineering

Abstract: Rare Earth Barium Copper Oxide (REBCO) superconducting thin film with low surface resistance for microwave frequency applications has potential applications when grown on a flexible, dielectric template. In this study, a flexible yttria-stabilized-zirconia (YSZ) ribbon was utilized as a suitable dielectric substrate for high-frequency applications due to its low dielectric loss, low thermal conductivity, and chemical and thermal compatibility with REBCO and oxide buffer thin films. The YSZ substrate was planarized to a roughness of approximately 1 nm, allowing for the growth of high-quality, biaxially-textured magnesium oxide (MgO) by ion beam assisted deposition (IBAD), followed by magnetron-sputter-deposited homo-epitaxial MgO and LaMnO3 (LMO) layers. The LMO films on the flexible YSZ, with an out-of-plane texture of 3.1° and an in-plane texture of 6.7°, served as a suitable template for high-quality REBCO film growth. The uniformity in critical current density (J_c) at 77 K was characterized using Scanning Hall Probe Microscopy (SHPM) for 350 nm thick REBCO films grown by metal organic chemical vapor deposition (MOCVD). The RF performance of REBCO films on flexible YSZ at 8-8.3 GHz and 20-75 K was positively correlated with Jc (77K) and found to be superior to that of high-quality REBCO films on a sapphire substrate.

Bio: Mr. Jithin Sai Sandra is a graduate student associated with the research group of Professor Selvamanickam. He completed his master's degree in mechanical engineering from the University of Houston and is currently pursuing his PhD in the same field. His research focuses on the epitaxial growth of thin films on both metallic and nonmetallic substrates, with the aim of facilitating the growth of REBCO. Prior to commencing his PhD studies, Jithin worked as a mechanical engineer at AMPeers LLC, where he played a crucial role in achieving several project milestones, including the development of a 60 m long round REBCO STAR® wire. He has co-authored five publications and co-authored three pending publications to his credit.

Electronic structure analysis of air-stable 2D magnet CrSBr using RIXS

Jayajeewana Niranjana Ranhili Pelige

TcSUH and Department of Physics

Abstract: CrSBr is a new 2D magnetic material that has received enormous research interest recently. The material shows exceptional properties including air stability compared with other highly studied 2D magnets. Recent findings of this material have shown reversible strain-induced magnetic phase transitions, strong spin-phonon (SPC), and magneto-electronic coupling (MEC) effects. In our work, we study the strain-dependent electronic

structure of this material using resonant inelastic X-ray scattering (RIXS). We plan to investigate how resonant excitations of electronic states are related to d-d, ligand-to-metal charge transfer (LMCT), phonon, and magnetic excitations. The first round of data was collected at the Advanced Light Source (ALS) in Berkeley at different strain levels and excitation energies. A custom strain device has been developed in our lab for this experiment and it can apply ~3% maximum tensile strain on the sample. We will collect high-resolution RIXS data at BESSY II (Germany) and DLS (UK) RIXS beamlines to perform strain-dependent and momentum-dependent RIXS experiments on this material. The expected scientific outcomes are two-fold. First, the determination of precise energy scales will enable the development of relevant Hamiltonians of this new material using the obtained RIXS data. By applying the atomic multiplet theory, the electronic correlation (Racah) parameters can be extracted from the collected spectra. These energy scales will enable the prediction of both magnetic and electronic Hamiltonians. The second outcome will be the determination of the electron-phonon coupling (EPC) in CrSBr.

Bio: Mr. Jayajeewana Niranjana Ranhili Pelige is a physics graduate student. He completed his bachelor's degree at the University of Colombo, Sri Lanka. His research works are based on studying 2D magnetic materials using resonant inelastic x-ray scattering (RIXS) and ultrafast electron diffraction (UED) techniques. His advisor is Dr. Byron Freelon.

Forming Platinide Phases under Pressure in the Cs–Pt System

Roy A. Arrieta

TcSUH and Department of Chemistry

Abstract: Pressure is a fundamental thermodynamic variable that can dramatically influence the physical and chemical properties of materials. Applying pressure minimizes interatomic distances, modifies the electronic structure, chemical bonding, and alters the fundamental rules of chemistry. As a result, high pressure has emerged as an essential approach for creating compounds with atypical stoichiometries and unusual physical properties. Yet, despite expanded access to high-pressure synthesis techniques, these experiments remain complex and uncommon. The many challenges associated with high-pressure synthesis and crystal structure analysis have led to the development of computational-based crystal structure prediction algorithms to understand the complex crystal chemistry of inorganic solids at non-ambient pressure. In this study a series of platinide-containing phases were identified as thermodynamically favorable compounds at high pressure using an unbiased automatic crystal structure searching method. The identification of these phases also expands the known anionic 5d transition metals to include Ir, Pt and Au.

Bio: Mr. Roy A. Arrieta is a 4th year graduate student in Dr. Brgoch research group.

Join Zoom Meeting (Meeting ID: 263 324 2787): https://tinyurl.com/2p9de9zh

RSVP BY Friday, January 24 at 3:00 p.m. for Sandwiches from Mondo's (for the seminar attendees), Drinks, and Snacks: https://forms.office.com/r/f5sVwVr2mZ

Persons with disabilities who require accommodations to attend this seminar should call 713-743-8212