



## 2<sup>nd</sup> TcSUH STUDENT/POSTDOC SEMINAR

November 5, 2018 - 5:30 p.m., HSC 102

Vietnamese Sandwiches and soft drinks will be served!!

---

### Compatible Organic Cathode-Sulfide Interface Enables High-Energy and Long-Cycle-Life All-Solid-State Batteries

**Fang Hao**

TcSUH and Department of Electrical and Computer Engineering

**Abstract:** All-solid-state sodium-ion batteries (ASSSBs) based on sulfide solid electrolytes (SSEs) are the most promising large-scale energy storage devices. However, the reported performances of ASSSBs are unsatisfactory due to the interfacial issues existing between inorganic cathode materials (ICMs) and SSEs. ICMs with the aggressive redox potentials hardly match with the anodically unstable SSEs, resulting in the formation of the highly resistive layer at the interfaces. Their rigid mechanical properties also bring more challenges for SSEs to buffer the volume change upon cycling. Herein, we show an organic cathode material (OCM) pyrene-4,5,9,10-tetraone with moderate redox voltage and low Young's modulus can form an electro-chemo-mechanically compatible interface with SSE. The OCM-based ASSSB therefore exhibits high specific energy of 587 Wh kg<sup>-1</sup> and the record cycling stability (89 % retention over 500 cycles) among reported ASSSBs, establishing a significant role of OCMs for advancing the performances of ASSSBs.

**Bio:** Mr. Fang Hao is currently a Ph.D. candidate in Dr. Yan Yao's group in the department of Electrical and Computer Engineering and Texas Center for Superconductivity at University of Houston.

---

### Development of REBCO Tapes on Non-Metallic Substrates for RF Applications

**Yuan Zhang**

TcSUH and Department of Mechanical Engineering

**Abstract:** RE-Ba-Cu-O (REBCO, RE = rare earth) films on flexible, low-cost and low thermal expansion substrate offer unique advantage for RF applications such as surface receiver coils for Magnetic Resonance Imaging (MRI). In this work, polycrystalline, inexpensive, lightweight and flexible yttria-stabilized zirconia (YSZ) with low thermal conductivity and low RF loss was used as a substrate for epitaxial REBCO films. The YSZ substrate surface was planarized to a surface roughness  $R_q$  of about 1nm. Ion-beam assisted deposition (IBAD) was used to obtain highly-oriented single-crystalline-like buffer templates. Homo-epitaxial MgO and epitaxial LaMnO<sub>3</sub> (LMO) thin films were deposited via reel-to-reel magnetron sputtering. LMO's out-of-plane and in-plane texture values were optimized to 2.6° and 6.8° FWHM respectively. Epitaxial GdYBCO was grown by an Advanced Metal Organic Chemical Vapor Deposition (A-MOCVD) on the buffered YSZ substrates with in-plane texture average 4.3° FWHM. Magnetic critical current density ( $J_c$ ) at 77 K, 0 T measured by a physical property measurement system (PPMS) is 0.84 MA/cm<sup>2</sup>. Quality factor (Q factor) measured at 77 K, 12.9 GHz is 70 % as that of high quality epitaxial REBCO films single crystal rigid substrates. Epitaxial REBCO films on the YSZ polycrystalline substrates can be used to construct RF coils for MRI applications.

**Bio:** Ms. Yuan Zhang is currently a Ph.D. student in Dr. Venkat Selvamanickam's group in the department of Mechanical Engineering and Texas Center for Superconductivity at University of Houston.

---

RSVP: [tcsubstudents@uh.edu](mailto:tcsubstudents@uh.edu)

*Persons with disabilities who require accommodations to attend this seminar should call 713-743-8213.*