



12th TcSUH STUDENT/POSTDOC SEMINAR

Monday, May 9, 2022 - 5:00 pm, HSC 102

or join by Zoom:

(Meeting ID: 912 8116 7561, Passcode: 540375): <https://tinyurl.com/5chf63r6>

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

Cobalt doped BiOCl Nano-Coins for Efficient N₂ Photo-Fixation Under UV-Visible Light without Sacrificial Reagent

Mohammadjavad Mohebinia

TcSUH and Materials Science and Engineering Program

Abstract: Photocatalytic ammonia production is an excellent solution to mitigate carbon dioxide emission in two different ways; firstly, by obsoleting the old Haber Bosch-based factories and secondly, by storing clean hydrogen fuel in the form of ammonia. However, there is a long way to achieve these goals due to the inertness of nitrogen molecules and rapid recombination of the charge carriers in the photocatalyst nanoparticles. In this work, we have proposed a novel method to modify BiOCl nano-coins by cobalt doping for the photocatalytic nitrogen reduction reaction. The modified BiOCl nano-coins showed a notable photocatalytic NH₃ generation rate in pure water. The strong OER catalytic performance of nano-coins and boosted electron/hole separation efficiency, due to separation of NRR and OER active sites, allowed 4.6 times improvement of ammonia evolution rate.

Bio: Mr. Mohammadjavad Mohebinia is currently a Ph.D. candidate in Dr. Jiming Bao's group in the Department of Electrical and Computer Engineering and Texas Center for Superconductivity at University of Houston.

Spectroscopic Analysis of Electron Energy Loss and the Effect of Dielectric on the Rate of Photon Emission

Dipendra Dahal

TcSUH and Department of Physics

Abstract: A beam of charged particles moving parallelly over a heterostructure loses a considerable amount of energy due to Coulomb's interaction with the structure. The rate of this energy loss depends on several parameters such as the type of structure considered, the height at which the charged particles are moving, etc. We have carried out a spectroscopic analysis of the rate of energy loss by this charged beam. In addition, we have calculated the effect on the rate of photon emission being tuned by the presence of dielectric media, it's the thickness and the height at which the two-level atomic system is placed. The results and the conclusion of the research will thoroughly be presented.

Bio: Dr. Dipendra Dahal is currently a Postdoc in Dr. Chin-Sen Ting's group in the department of Physics and Texas Center for Superconductivity at University of Houston.

TEM Study of Structural Defects in Thermally Activated Thermoelectric Materials

Brian P McElhenny
TcSUH and Department of Physics

Abstract: Thermoelectric energy conversion has the potential to be a significant component to a green energy future by increasing our energy usage efficiency through the conversion of waste heat into electricity. Thus far the wide spread adoption of thermoelectric generators (TEGs) is not economically feasible due their low energy conversion efficiency. The forefront of thermoelectric research involves the fabrication of exceptional semiconductors with electrical, thermal, and mechanical properties that rely heavily on structural defects on the micro, nano, and atomic scales. The Zintl structured Mg_3Sb_2 based compounds, being among the most promising candidates for a new generation of commercially available TEGs, can exhibit a thermally activated charge carrier mobility that can impede the material's overall performance across its desired operational temperature range. The source of this behavior remains an open question, as this work employed Transmission Electron Microscopy (TEM) to study the compound $\text{Mg}_{3.2}\text{Sb}_{1.5}\text{Bi}_{0.5}\text{Te}_{0.01}$ in search of structural differences that can be correlated with the change in mobility to better understand the thermally activated phenomena.

Bio: Dr. Brian P McElhenny is currently a Postdoc in Dr. Shuo Chen's group in the department of Physics and Texas Center for Superconductivity at University of Houston.

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RSVP BY Friday, May 6th at 2:00 p.m. for Sandwiches (for the seminar attendees), Drinks, and Snacks:
<https://forms.office.com/r/2XhQ3ggq29a>