

Crushing Chemistry

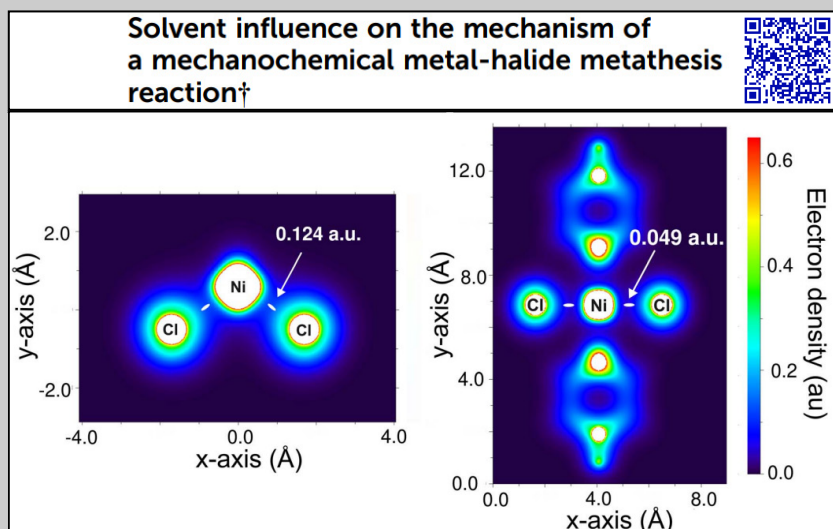
❖ NSF Center for the Mechanical Control of Chemistry ❖
April 2025

Dr. Karunadasa Presents on Mosaic Halide Perovskites at ACS Spring 2025



Dr. Hemamala Karunadasa, a J.G. Jackson and C.J. Wood Professor of Chemistry at Stanford University, presented her team's latest work on mosaic perovskites at the ACS Spring Meeting in San Diego. Her talk highlighted how mechanochemical milling can create complex perovskite alloys with unique metal stoichiometries and emphasized the fact that these structures cannot be made through traditional solution-based methods. Furthermore, the resulting materials from mechanical milling show intriguing optical and magnetic properties, and provide new insights into local packing and orbital interactions in perovskites.

New Publication in *RSC Mechanochemistry*



A recent publication in *RSC Mechanochemistry* from the Martini and Hanusa labs explores how subtle changes in solvent conditions can dramatically alter the outcomes of nickel-based mechanochemical reactions. The team reacted a bulky allyl anion salt with nickel halides under three conditions: without solvent, with a small amount of pyridine, and in pyridine solution. Each condition led to a different reaction pathway. In some cases, halide metathesis produced the allyl complex in nearly quantitative yield. In others, a redox process generated allyl radicals that coupled to form a diene. Using Density Functional Theory, the researchers showed that pyridine weakens the nickel chloride bond and enables metathesis, while solvent-free conditions favor the redox route. These insights offer new tools for understanding and controlling solvent-assisted grinding reactions at the molecular level.

Dr. Carpick Honored for Outstanding Student Advocacy



Dr. Robert Carpick, John Henry Towne Professor at the University of Pennsylvania, was awarded the Michael L. Barrett (ENG'89) and Traci Barrett (W'91) Faculty Award for Student Advocacy from the School of Engineering and Applied Sciences at the University of Pennsylvania. This award recognizes a member of the Penn Engineering faculty for their exceptional support of undergraduate students and their outstanding commitment to building community. This student-nominated annual award was decided by the Penn Engineering's Underrepresented Student Advisory Board in Engineering (USABE) and the Engineering Deans' Advisory Board (EDAB).

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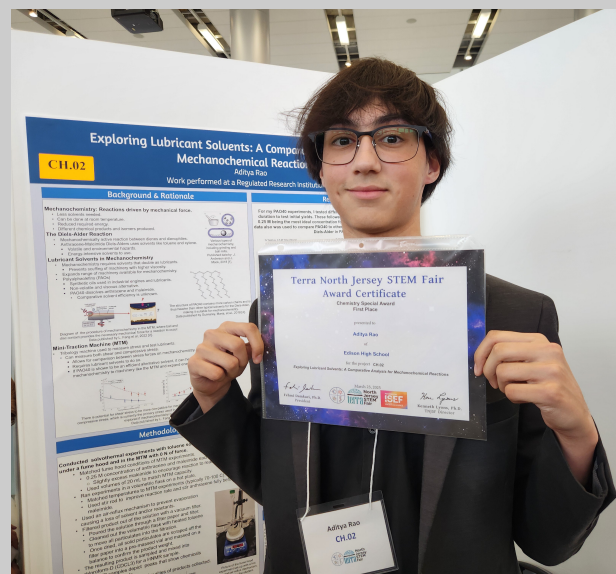


Dr. Kumar Presents at UC Merced & ACS Spring 2025



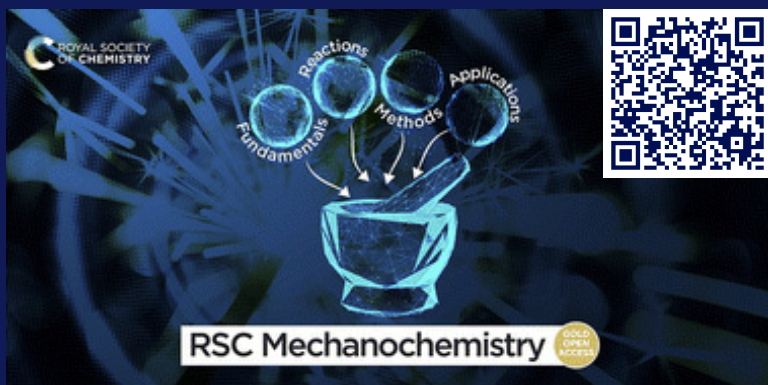
Dr. Sourabh Kumar, a postdoctoral researcher in Prof. Ashlie Martini's group at the University of California, Merced, recently gave a guest lecture to UC Merced undergraduate and graduate students on Computational Tools in Mechanochemistry. His talk covered the implementation of mechanical forces at both atomic and bulk scales to model mechanochemical reactions. Additionally, Dr. Kumar presented a collaborative project with Prof. Timothy Hanusa (Vanderbilt University) at the ACS Spring 2025 conference in San Diego, highlighting the role of solvents in influencing mechanochemical processes.

Aditya Rao Wins ACS Chemistry Award at NJ STEM Fair for CMCC Research



High school student Aditya Rao, who worked in Dr. Carpick's lab at the University of Pennsylvania during Summer 2024, was recognized for his CMCC research at the Terra North Jersey STEM Fair (TNJSF) held March 22–23 at Kean University. Under the mentorship of CMCC graduate student Will Oprisu, Aditya presented on mechanochemistry and lubricant solvents, comparing PAO40 to toluene and other typical solvents used in the Diels–Alder reaction. His project supported PAO40 as a viable solvent based on solubility and reaction yields. For this work, Aditya received the Chemistry Special Award First Place from the American Chemical Society, earning a certificate, plaque, and a \$250 prize.

New Publication in *RSC Mechanochemistry*



Dr. James Batteas (Texas A&M) and Dr. Tomislav Frišić (University of Birmingham) outline the urgent need for standardized reporting and analysis across mechanochemical platforms in a new *RSC Mechanochemistry* article. As the field of mechanochemistry continues to grow with tools like ball milling, extrusion, and acoustic mixing, the authors call for clearly defined parameters to support reproducibility, scale up, and data sharing. They also introduce the CMCC's open-access Mechanochemical Reactions Database to support collaboration and machine learning efforts across the community.

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Ryan O'Shea Awarded NSF GRFP & ACS Inorganic Chemistry Award



Ryan O'Shea, an undergraduate student in Dr. Altman's lab at Texas A&M University, received the ACS Undergraduate Award in Inorganic Chemistry. This award is given annually to one student in each participating chemistry department to recognize outstanding research, coursework, and career potential. His research on the electronic and magnetic properties of lanthanide-based materials in the Altman Lab has led to national conference presentations. In addition, Ryan received the prestigious NSF Graduate Research Fellowship Program (GRFP) Award, a highly competitive honor recognizing his academic excellence and research potential. **Congratulations, Ryan!**

Additional ACS Presentations from the CMCC



"AFM Studies of Mechanochemical Reactions on Graphene"

**Presented by Dr. James Batteas,
Director of the CMCC &
Professor at Texas A&M University**



"Spectroscopic Elucidation of Pressure Driven Electronic
Configurational Changes in f-Element Materials"

**Presented by Dr. Alison Altman,
Professor at Texas A&M University**

Dr. James Batteas Receives Distinguished Achievement Award for Research

Dr. James Batteas, Director of the NSF Center for the Mechanical Control of Chemistry (CMCC) and Regents Professor of Chemistry at Texas A&M University, has been recognized with the 2025 University Distinguished Achievement Award for Research by The Association of Former Students. This award highlights his significant contributions to the field of mechanochemistry. Dr. Batteas' work, exploring the role of mechanical forces in chemical reactions, continues to impact both academic research and practical applications.

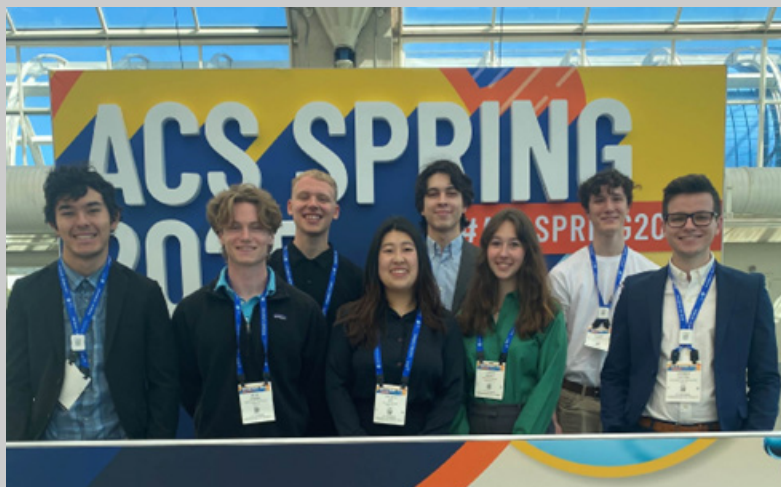


Photo credit: Butch Ireland

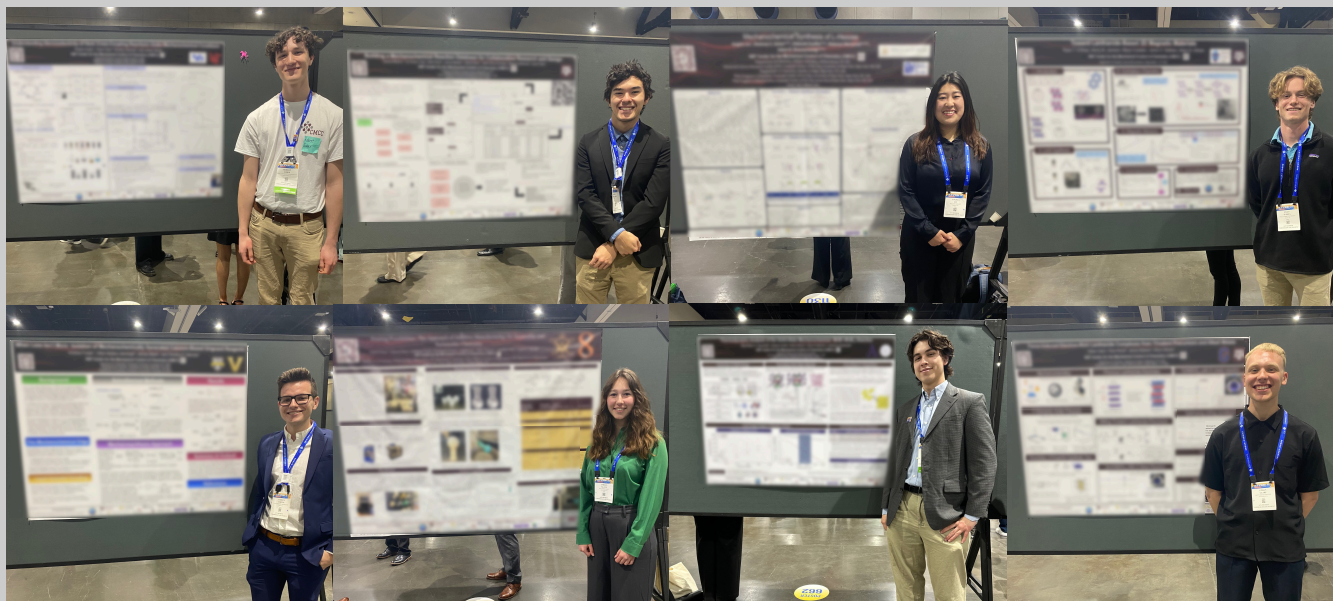
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Our 2024 REU Cohort Presented at ACS Spring 2025



On March 24, eight students from our 2024 Research Experience for Undergraduates (REU) program presented their research at the ACS 2025 Spring Meeting in San Diego. They also had the opportunity to reconnect with CMCC faculty, graduate students, and collaborators attending the conference.



Using Force to Accelerate Reactions and Build a Mechanochemistry Database

This month, Dr. Daniel Tabor, Assistant Professor at Texas A&M and CMCC faculty member, joined our CMCC Mechanochemistry Discussions Seminar. He shared how his lab uses high-throughput screening, machine learning, and physical models to identify reactions that can be accelerated by mechanical force. Dr. Tabor also highlighted the CMCC's growing Mechanochemical Reaction Database (CMCCDB), a collaborative tool tailored to mechanochemistry research.

**Watch here and join us every third
Thursday of the month!**

