CMCC Mechanochemistry Discussions

Online Seminar Series

Quantitative Mechanochemistry at Sliding Interfaces Using Atomic Force Microscopy

Livestreaming at 10:00 AM (CT)

THURS., June 16, 2022

on the CMCC YouTube Channel:
https://www.youtube.com/channel/UC7eCYPKbGTKpgO7W2bNABxg

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ABSTRACT:

A grand challenge in mechanochemistry is bridging the gap from our analytical understanding of forces applied to molecules at the atomic level to experimental synthesis in relatively chaotic macroscale environments. This talk highlights advances in atomic force microscopy used to quantitatively study mechanically-driven reactions on surfaces. In particular, reactions on graphene provide a chemical system with relatively well-defined chemical structure and bond orientation, making it possible to study reaction kinetics and thermodynamics with near atomic resolution at the sliding tip interface. By precisely controlling applied forces, sliding speed, temperature, and electric fields, it is possible to quantitatively determine critical reaction parameters, including the reaction rate, activation barrier of the reaction, and activation volumes. Further, it is possible to determine which component of the applied force drives particular reactions. The experimental framework developed here provides a rich suite of tools to understand tribochemical and mechanochemical reactivity at the atomic scale, by directly linking experimental measurements to fundamental theories used to describe reactivity.

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