Please join us

Wednesday, April 6th, 2022

At 4 PM

Seminar will be available on Zoom:

https://mit.zoom.us/j/93893618327?pwd=aWlCdTFVRTROamJWY2hLeWpRSW5udz09

Password: 983044
Meeting ID: 938 9361 8327

Speaker Prof. Phillip B. Messersmith

Abstract Title:
Mussel-Inspired Materials:
From Molecular Mechanics to Application

Civil and Environmental Engineering

Henry L. Pierce Laboratory | Seminar Series

Mussel-Inspired Materials: From Molecular Mechanics to Applications

Abstract

Phenols are important components of biological tissues, where they perform a variety of biological functions including chemical defense, redox and antioxidant properties, pigmentation, and bioadhesion. One of the most important families of phenols are catechols (ortho-dihydroxyphenyls), which in humans take the form of neurotransmitters and the main building blocks of melanin pigments. However, the catechol functional group is rarely found in structural proteins with the exception of marine adhesives. Celebrated examples are the proteins of the byssus, the attachment organ of the mussel. Some byssal proteins contain high levels of the catecholic amino acid 3,4-dihydroxy-L-alanine (DOPA). DOPA is believed to contribute to both the interfacial and bulk mechanical performance of the tissue. Satisfying such diverse roles is only possible because catechols participate in a remarkably broad range of chemical interactions that include noncovalent coordination interactions with metals/metal oxides, strong hydrogen bond, cation-pi and pi-pi interactions, redox activity, and covalent coupling with nucleophilic organic species.

In this talk I will review what is known about the function of DOPA in the mussel byssus and describe ongoing efforts focused on the mechanochemical behavior of DOPA at solid-liquid interfaces. Emphasis will be placed on mechanical characterization across length scales, from single molecule to macroscopic adhesion methods. These studies are informing the development of novel functional materials for a variety of applications, and I will provide a few selected examples of how we seek to exploit catechols as building blocks of structural composites, synthetic bioinspired adhesives, hydrogels and coatings.

Bio:

Phillip B. Messersmith is the Class of 1941 Professor in the Departments of Bioengineering and Materials Science and Engineering at UC-Berkeley. He earned his B.S. degree in life sciences from the University of Illinois at Urbana, M.S degree in bioengineering from Clemson University, and his Ph.D. degree in materials science and engineering from the University of Illinois at Urbana. Previously, Dr. Messersmith was a postdoctoral fellow at Cornell University (1993-1994), and a faculty member at University of Illinois at Chicago (1994-1997) and Northwestern University (1997-2014). Dr. Messersmith has published over 220 papers and has 44 patents awarded. His awards and honors include a MERIT award from the National Institutes of Health, the Langmuir Lecture Award from the American Chemical Society, and the 2013 Clemson Award for Basic Research from the Society for Biomaterials. Dr. Messersmith is a fellow of the American Institute for Medical and Biological Engineering, the Royal Society of Chemistry, and the International Union of Societies of Biomaterials Science and Engineering. His current research interests are in understanding structure-processing-property relationships in biological and

Phillip B. Messersm

Professor, Bioengineering and Science and Engineering at UC

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For additional information please

https://bioinspiredmaterials.berke

Faculty Host: