



VILLANOVA UNIVERSITY
**MECHANICAL ENGINEERING
DEPARTMENT**
Fall 2019 SEMINAR SERIES

Seminar Date: September 13th, 2019

Lecture: Next Generation Lithium Batteries

Speaker: Dr. Stephanie Wunder

Abstract:

As applications for energy storage systems have broadened, lithium ion batteries (LIBs) no longer provide the necessary energy and power densities that will be required for electric vehicles and portable devices, and are not cost effective for the storage of energy from solar/wind sources. Further, the liquid electrolytes used in commercial LIBs can ignite and this safety hazard increases if Li^0 metal intercalated graphite LiC_6 as the anode. One way to make safer batteries is to replace volatile liquid electrolytes with solid electrolytes. However, inorganic lithium ion conductive ceramics, which can have high ionic conductivities are brittle and adhere poorly to the electrodes, while polymer electrolytes have low conductivities but adhere to electrodes and can be formed into thin films. One solution is to form hybrid solid electrolytes made from both components. These can be in a sandwich-geometry with the polymer on either side the ceramic, or in a composite with the ceramic as filler in the polymer matrix. Between the two phases, there is an impediment to the migration of the Li^+ ions across the interface. An overview of next generation lithium batteries and problems that are as yet unresolved will be discussed.

Biography:



Dr. Wunder is a polymer physical who received her BA from Barnard College, Columbia University and her PhD from the Department of Polymer science and Engineering at the University of Massachusetts at Amherst in 1979. She was a post-doctoral fellow at the Naval Research Laboratory, worked at NBS (now NIST) and was a research scientist at E.I. duPont in the Textile Fibers Department before joining the Department of Chemistry at Temple University in 1985. Dr. Wunder's current research in materials science is focused on the development of gel and solid electrolytes for lithium/sodium metal/ion batteries, and supercapacitors. In particular, her lab has been investigating and publishing on organic ion-gel electrolytes formed from ionic liquids and polymers, soft-solid co-crystals formed from LiX or NaX and low molar mass organics, and methods to form mixed ceramic/polymer single

ion conductors.

Host: Prof. David Cereceda