Monday, April 13th 2-3PM Livermore Room

Title: Ultra-low wear fluoropolymer composites: it's all about the tribochemistry

Christopher P. Junk, Ph.D.
Senior Principal Investigator, DuPont Central Research and Development

Dr. Junk received his B.S. degree in chemistry from St. Norbert College (DePere, Wisconsin) and his Ph.D. degree in chemistry from Dartmouth College (Hanover, New Hampshire). His graduate work (advisor: David Lemal) involved synthesis and characterization of a highly strained fluorinated olefin with a fun name: octafluorobicyclo[2.2.0]-hex-1(4)-ene.

Opting for a job in industry, Dr. Junk's first assignment was in Teflon® research at the DuPont Washington Works production plant in West Virginia, where he performed research on both existing and new perfluoro copolymers and surfactants.

He moved to DuPont Central Research & Development (CR&D, Wilmington, DE) in 2003 and has been there since working on a variety of topics including:

- synthesis of applications of fluorinated superacids made from DuPont fluoromonomers
- TFEDMA: a fluorinating reagent made from tetrafluoroethylene (TFE)
- synthesis and applications of ionic liquids
- synthesis of and polymerization using fluorinated surfactants
- improved perfluoroelastomers (Kalrez®)
- most recently, and the topic of this seminar: Ultra-low wear fluoropolymer composites

Dr. Junk is co-author of 15 peer-reviewed papers and inventor on more than 30 granted US patents.

Abstract:

Over the last decade, several research groups have explored an intriguing set of materials based on Teflon* PTFE 7C (a granular molding resin) and certain alumina "nanoparticles." These materials are exceptional because small amounts of alumina additive (often less than 5 wt.%) improve the wear performance of the PTFE composite by over four orders of magnitude. It is believed that the "nano" sized alumina somehow shuts down the flaky wear mechanism of the PTFE, and stabilizes the formation of a persistent transfer film. We have now elucidated the chemical mechanism behind the mechanochemistry which allows generation of a robust thin transfer film and thus ultra-low wear. The focus of this talk will be on this unique chemistry and the role it plays during fluoropolymer sliding wear against a metal countersurface.