MATERIALS SCIENCE AND ENGINEERING

SEMINAR

"Free Volume in Piezoelectric Polymers"

by

Gamini Mendis

Purdue MSE Prelim 1

Advisor – John Howarter & Inez Hua

ABSTRACT

Free volume is a measure of the unoccupied or excluded space in a polymer and is an important characteristic of polymer systems. By understanding the size and distribution of free volume in polymers, better control of physical properties, such as modulus, glass transition temperature, and diffusivity, can be obtained. Fundamental polymer models utilize free volume to describe phenomenon such as time temperature superposition, where a combination of temperature and mechanical oscillation determine the stiffness of the polymer. In piezoelectric polymers, applied electric fields cause the polymer to strain, which alters the free volume distribution and may enable a method to achieve time-temperature superposition using oscillating electric fields to mimic mechanical oscillation. Here, a model is presented to demonstrate the various physical phenomenon occurring in a semi-crystalline piezoelectric poly(vinylidene fluoride) system. An experimental method is proposed to validate the model using positron annihilation spectroscopy to characterize free volume sizes and distributions under various thermal and electrical conditions.

Date: Wednesday, November 19, 2014
Time: 10:30 A.M.
Place: ARMS 1103

PURDUE MSE