CENTER FOR NANOHYBRID FUNCTIONAL MATERIALS

FRIDAY
JUNE 27, 2014
2:30 – 4:00 PM
W213 NEBRASKA HALL
UNL

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From Polymer Molecules to Materials: Controlled Morphology and Properties through Processing and Crystallization

Control of the crystallization process of polymers is key to optimizing their final properties. The semicrystalline morphology is strongly dependent on molecular attributes (such as molecular weight, regularity, polydispersity) and crystallization conditions (i.e. temperature, flow, pressure). In turn, the nano- and micro-structure determine the ultimate properties that can be achieved (mechanical, optical, diffusion, conduction, etc). Some aspects of polymer crystallization remain elusive, particularly when processing flows are imposed. In addition, advances in synthesis and the advent of new polymers offer novel opportunities to control the crystallization process.

The objective of my research is to obtain a fundamental understanding of the molecular structure-processing-morphology-properties relationship to ultimately enable rational design of materials and processes. Processing flows can greatly accelerate crystallization kinetics and induce formation of highly oriented crystallites due to the development of oriented thread-like precursors during flow. The effect of molecular defects on crystallization, morphology and properties of polyethylene and polypropylene under both quiescent and flow conditions is examined. The critical effect of chain stretch and polydispersity on flow-induced crystallization is demonstrated with polymer blends of bimodal molecular weight distribution. Also, a depth sectioning method for real-time birefringence and x-ray scattering is applied to quantify the formation of oriented precursors during flow of isotactic polypropylene.

Seminar hosted by Dr. Tino Hofmann, UNL Department of Electrical Engineering

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