INVITED LECTURE - MASAMI OKAMOTO

26TH ANNUAL MEETING
POLYMER PROCESSING SOCIETY
July 4-8, 2010 | Banff, Canada

Polymeric Nanocomposites : Dynamics in confined space

Masami Okamoto
Graduate School of Engineering,
Toyota Technological Institute,
Japan

The nanocomposites and their self-assembly behavior have recently been approached to produce nanoscale polymeric materials. Additionally, these nanocomposites have been proposed as model systems to examine polymer structure and dynamics in confined environments The existence of percolated organo-clay network structure, which is ignored in many literatures as always, is responsible for the soft glassy dynamics in various nanocomposite melt rheology. This mesoscopic structure is intrinsically disordered metastable state and out-of-equilibrium, and offers an apt analogy to soft colloidal gels. The mobility and relaxation of macromolecular chains are retarded by the geometric confinement of the organo-clay networks. This review provides details concerning the mesoscale network structure in nanocomposite melts in the light of rheometry with a combination of scattering experiment and electron microscopy. We also present the nonisothermal disorder-order phase transition (chain packing) kinetics and disorder transition (chain melting) behaviors including the conformational changes of the chain segment of the alkyl chains in confined space (nano-gallery space of the layered fillers). Knowledge of such investigations shall be useful in assessing how does the phase transitions appear to be fundamentally different from those observed in bulk.