Nanoscale Phenomena in Toughening and Strengthening of Polymers

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　　　ダイナミック・アライアンス

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テキサス A&M 大学の Hua-Jue Sue 先生は、新規な実用高分子材料の創製を目標に、高分子材料の力学的性質の解明に様々なアプローチから取り組まれています。今回は、強靭な高分子材料を構築するための材料設計に関する研究を中心にご講演をいただく予定です。皆様の多数のご参加をお待ちしております。

Abstract: Toughening and strengthening of polymers has been the research focus of the academia and polymer industry since the 70s.   Many theories and practices have been successfully implemented in many commercial products.   However, the well-established approaches for polymer toughening and strengthening are usually accompanied by unwanted compromises, such as drop in Tg, modulus, and processability, or exhibiting poor low temperature performance.   The advent of nanotechnology in the 90s has led to expectation of development of novel strong and tough polymers through incorporation of nanoparticles, either organic or inorganic.   In many cases, but not a guarantee, nanoparticles do show benefit over the micro-sized counterparts in toughening and strengthening of polymers.   In this talk, two intriguing examples of nanoscale phenomena that show great effect in toughening and strengthening of polymers are presented.   One system is based on utilizing poly(ethylene-alt-propylene)-b-poly(ethylene oxide) (PEP-PEO) block copolymer to improve fracture toughness of epoxy without compromising Young's modulus.   The other system is based on a hybrid nanoparticles (clay and carbon nanotube) approach to strengthen epoxy matrix.   Fundamental knowledge on polymer toughening and strengthening will be introduced, followed by revelation of the nanoscale toughening and strengthening phenomena observed in the above two model systems.   Issues related to the preparation of strong and tough polymers will be discussed.