Spring 2009 SEMINAR SERIES

F21C Bioprocessing & Biosensing Center

• DIVISION OF FOOD SYSTEMS & BIOENGINEERING •

PRESENTER: **Dr. Lina Zhang**
Department of Chemistry, Wuhan University, Wuhan 430072, China

TITLE: **New Functional Materials from Soy Protein**

ABSTRACT:
Protein-based "green" materials have become a research focus because of their high performance, low cost, and eco-friendly characteristics. In our laboratory, the incorporation of chitin whisker into soy protein isolate (SPI) matrix, the dispersion of highly exfoliated montmorillonite layers in the SPI, as well as creation of lotus-like structure has showed significant improvement in the water resistance or the mechanical properties of the SPI materials. These materials were characterized by Fourier transform infrared spectroscopy, scanning- and transmission electron microscopy, atomic force microscopy, thermogravimetric analysis, dynamic mechanical thermal analysis, and tensile testing to evaluate their structure and properties. Thermoplastic nanocomposites were developed using a colloidal suspension of chitin whiskers as filler to reinforce SPI plastics. The incorporating of chitin whisker into SPI matrix led to an improvement in water resistance, tensile strength and Young's modulus for the SPI/chitin whisker nanocomposites. Further, SPI/Na^+-montmorillonite (MMT) plastics were prepared from the mixture of the SPI/MMT nanocomposties and glycerol by compression-molding to obtain the highly exfoliated MMT layers for the protein matrix containing MMT lower than 12 wt%, and the intercalated structure for the MMT content was higher than 12 wt%. The fine dispersion of the MMT layers and the strong interactions between SPI and MMT resulted in the significant improvement of the mechanical strength and thermo-stability of the SPI/MMT plastics. Inspired by the Lotus effect, SPI containing 2,2-diphenyl-2-hydroxyethanoic acid films (SB) were successfully prepared with bis-(2-hydroxyethyl)sulfide as a plasticizer by compression molding. By immersing the SB films in water for 26 h, we prepared the films (coded as SB-WM) having good water resistance. The SB-WM films exhibited significantly higher contact angle than SB film, and possessed a lotus-like nanoscale structure with increased hydrophobicity, through the process of the solvent induced microphase separation during the immersion in water. In addition , SPI monomer/hydroxyapatite (HAp) or aragonite (coded as 7S/HAp or 11S/aragonite), namely, organic/inorganic hybrid nanomaterials, were prepared by coprecipitating from SPI aqueous solution containing $Ca(OH)_2$ under different pH and ion strengths, respectively. The organic/inorganic self-assembly process was induced by the molecular recognition between the protein host and the inorganic nanocrystal guest, indicating precise nanostructures in the system.

BIOGRAPHY:
Lina Zhang is currently a Professor at Department of Chemistry of Wuhan University in China. She was graduated from Wuhan University in 1963. In 1985, she got JSPS research fellowship and studied the solution properties of polysaccharides at Osaka University. In recognition of her excellent achievement, she was awarded National Excellent Teacher (1993), "5.1" Medal as National Model Worker (2000), and National excellent woman inventor (2002). She has been awarded 6 Scientific and Technological Prizes in China, and has published near 300 papers in international journals as well as 47 patents. In addition, she has published "Modern Research Methods in Polymer Physics" (2003), "Modified Materials from Natural Polymers and their Applications" (2006), and "Science and Materials in Natural Polymers" (2007).

DATE • TIME • LOCATION:

Tuesday, March 17, 4:00 pm • Ag Eng Bldg 105