

F-18

Limitations and potentials of polymers derived from soybeans

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Sustainable development is still the driving force for seeking alternative resources for affordable and performable polymers. The environment impact of persistent petroleum footprints is also of growing global concerns. Proteins and triglycerides from soybean oilseeds have been researched in the past two decades, however, commercial products are still limited to high performance resins for adhesives and coatings. This seminar provides a review about the research and commercialization efforts, and focus on the advanced biobased chemicals and polymers from soybean oilseeds mainly from protein and triglycerides. Soy proteins are polymeric materials with great promise for development of biobased adhesives. Soybean protein is a major plant protein source, containing about 40% storage proteins that are configured with commonly used amino acids forming primary, secondary, tertiary, and quaternary complex three-dimensional structures. Soy protein contains both hydrophobic and hydrophilic groups that dominate protein folding, aggregation, gelling, self-assembly, adhesion, and cohesion properties. While soybean triglycerides contain a variety of fatty acids with single, double and triple double-bonds. Part of this seminar discusses the role of functionality in adhesion and mechanical strength of the resins derived from soybean oils. Understanding these properties would help recognize the limitations and potential for better utilizing soy proteins and triglycerides. Case studies are provided to illustrate the potential applications for adhesives and coatings as well as the potentials for high performance polymers development from soybeans.