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Upgrading vegetable oil thermosets through copolymer reinforcement with tannin-lipid conjugates

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A totally bio-based approach has been applied to produce thermosetting polymers comparable to synthetic polyester thermosets. Condensed tannin-lipid conjugates have been copolymerized with vegetable oils to produce copolymer films ranging from rigid thermosets to soft rubbers. Reactivity and vegetable oil quantity employed has the greatest influence on copolymer crosslinking and mechanical properties, whereas tannin incorporation was essential for copolymers to achieve necessary mechanical strength. Use of tannin linoleate esters led to copolymers with ambient modulus of up to 1.7 GPa and glass transition temperatures above 70°C. Combination of oleate esters and higher oil contents led to rubber-like copolymers comprising relatively rigid and soft domains. This work discusses the control of copolymer properties and crosslink densities through tuning vegetable oil reactivity and degree of unsaturation present in tannin ester chains.

Biography

Warren Grigsby is a Researcher Leader at Scion (New Zealand) with research activity spanning synthetic and polymer chemistry applications of biopolymer systems. Warren is leading the development of bio-based adhesive and polymer systems that can be used as substitutes for chemicals derived from petroleum. He has a lead role in the direction and coordination of innovative research efforts in both commercial and government-funded research. His current research activities include the synthesis of biobased adhesives and resins for use in engineered wood products and high performance composites, novel wood modification processing strategies, and adapting polyphenolics in a range of applications.

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