Sustainable Polymers
- Current and Future Research

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Synthesis of Blends of Submicron Polyethylene and Biomass via Aqueous Emulsion Polymerization

- Use of water in the polymerization process results in less dependence on oil, implies savings and is environmentally friendlier.

- The polyethylene is obtained as particles with diameter sizes as small as 50 nm leading to higher uniformity of the blends.

- The biomass (e.g. starch) is renewable, less expensive than the synthetic polymer and decreases further the overall carbon footprint.

- Based on the degradation of biomass alone, about half of the plastic waste would degrade within months rather than several centuries.

- The products, as latex or dried blends, have many end uses including thin films, coatings, adhesives, and agricultural plastics.
Synthesis of Copolyesters using Glycerol from Biodiesel Production

Main Benefits:
- Glycerol is the by-product of the sustainable process of biodiesel production
- Biodiesel glycerol is abundant and inexpensive
- The desired polymers are biodegradable
- Many biodiesel producers in NYS

Scheme for polymerization with aliphatic diacids

Scheme for polymerization with aromatic diester
Future Research on Sustainable Polymers

- Olefin copolymers, including those with polar comonomers and graft copolymers
- Polyolefin nanocomposites with inorganic fillers/additives
- Polylactates (PLAs) or polyhydroxybutanoates (PHBs)