



# Faculty Member

## Timken Foundation Center for Precision Manufacturing

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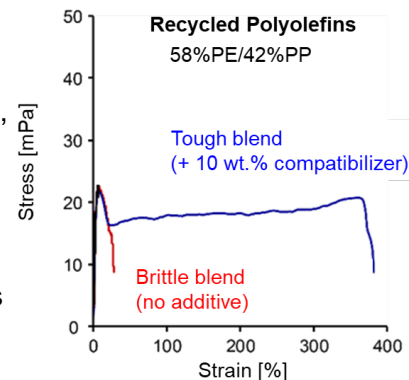
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### Research Interests

- Macromolecular engineering
- Sustainable plastics
- Polymer recycling
- Polymerization catalysis
- Polyolefin synthesis and properties
- Carbon dioxide utilization
- Biocompatible polymers and biomaterials

### Sample Research I: Recycling of Mixed Plastic Waste

- Recycling of mixed polymers results in a loss of mechanical properties
- Interfacial adhesion, compatibility, and polymer degradation all play important roles in the loss of properties
- We design and synthesize compatibilizer molecules that reinforce mixtures at low loadings (< 1wt.%)



### Sample Research II: Synthesis of Polymers from Carbon Dioxide

- CO<sub>2</sub> can be utilized as a chemical feedstock rather than emitted as a waste product (up to 50 wt.%)
- Advances in catalysis allow for the copolymerization of CO<sub>2</sub> with olefins and epoxides
- Polyesters, polycarbonates, and polyacrylates with a range of properties are accessed (thermoplastics, composites, rubber, rigid)

