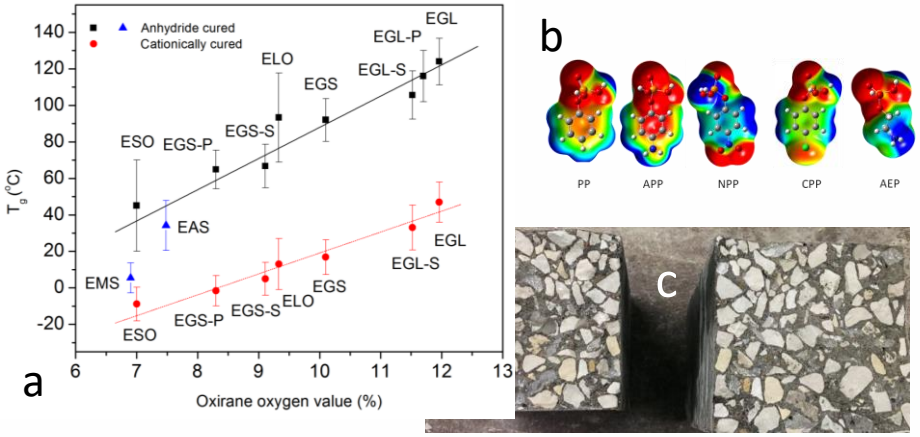
# Polymer Composite Materials

## Research Topics

- Renewable, agricultural industrial materials
  - Develop monomers and polymers from ag resources
  - Structure-property relationships toward commercialization
- Surface modification of inorganic oxide fillers
  - Tailor filler interfaces to improve performance
  - High energy storage density low loss dielectric composites
  - Concrete: higher tensile strength, reduced ASR, 3-D print
- Biomedical polymer composite cement
  - Strong, biocompatible nanocomposite of low internal stress
- Enhanced oil recovery polymer gels
  - Design composite and polymerization chemistry
  - Low cost, state of the art tools for directing resource flow

## Facilities

- Wet organic lab, Materials Research Center, NMR and other spectral characterizations, thermal analyses, dielectric and impedance characterizations, EOR analyses




a) Polymer glass transition as a function of soybean oil monomer oxirane conc.; b) Charge densities of ligands for dielectric composites; c) Smooth, cohesive failure mode for low ASR, higher tensile strength concrete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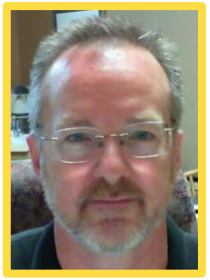


### Funding Sources

- Missouri and United Soybean Councils
- Office of Naval Research; U.S. Army; Dept. of Energy
- Industrial consortium (JIP) Enhanced oil recovery gels
- Cement – Concrete Associations; DOTs


## Keywords

- Composites, surface modification, polymer materials design and syntheses, oil recovery

## Recognitions/Significant Achievements

- State of art dielectric energy storage density, low loss
- Best paper Thermoset Resin Formulators Asso. (TRFA) meeting
- Several patent applications and commercialization processes