Preparation of Plastic Specimens from Canola Meal Protein Isolates

**Motivation**
- Economic, environmental, and political concerns regarding national petroleum usage has driven an increased interest in biobased fuels and other bioproducts.
- In order to maintain the cost-competitiveness of canola biodiesel industry, new higher-value uses for the oilseed meal will need to be developed.
- Soybean meal industry provides an excellent model of higher-value uses of an oilseed meal.

**Objectives**
- Development of bioproducts particularly suited to canola protein functionality.
- Advanced protein separation and modification via chemical and enzymatic treatments.
- Use of plasticizers to improve mechanical properties of canola-based biocomposites.
- Use of synthetic polymers (and compatibilizers) with canola proteins to improve strength and water resistance.
- Use of cross-linkers to improve strength and toughness.
- Combined extrusion and injection-molding for protein polymerization.

**Methodology**

**Canola Meal Separation**
- Raw canola seeds
  - Seed cleaning - using Carter-Day dockage tester according to USDA-GIPSA
  - Moisture conditioning
- Whole canola seeds at 7% MC
  - Feed rate 80 g/min
  - Screw pressing (barrel preheated to 70 °C)
- Canola oil
- Canola meal partially defatted
- Solvent extraction - Soxhlet
- Defatted canola meal
  - Z-Mesh – 25 mesh screen
  - Defatted canola meal flour

**Defatted canola meal flour**
- Solubilize in NaOH solution (pH 12)
  - Spin at 5000g
- Precipitation of proteins at isoelectric point
  - Spin at 5000g
- Protein pellet
- Lyophilization
- Canola meal protein isolate (CMPI)

**Protein Modification (Chemical Treatments)**
- Acetylation
- Succinylation
- Denaturation (SDS & SDBS)

**Tensile Properties**
- ASTM D638 - 86
  - Tensile Strength
  - Elongation at Break

**Flexural Properties**
- ASTM D790 - 86
  - Flexural Strength

**Compounding Extrusion and Injection Molding**
- Compounding extrusion of polymer blends was accomplished through the use of a Leistritz co-rotating twin screw extruder.
- Extruded polymer strands were pelletized and molded to prepare tensile and flexural test specimens using a Technoplas, Inc. Sim 5080 injection molder.

**Mechanical Property Testing**
- Tensile Strength - ASTM D638 - 86
- Elongation at Break - ASTM D638 - 86
- Young’s Modulus - ASTM D638 - 86
- Yield Strength - ASTM D882 - 91
- Flexural Strength - ASTM D790 - 86

**Future…!**