

International Conference and Exhibition on **Biopolymers & Bioplastics**

August 10-12, 2015 San Francisco, USA

Extrusion processing of zein to provide higher value with improved process ability

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Corn protein (zein) is one of the main co-products of corn bio-ethanol production and is known to have good film forming properties. However, zein also has deficiencies that may limit its applicability in the food packaging market. The properties of zein based articles will change on exposure to moisture and chemical modification is necessary to reduce the impact of moisture. Various techniques have been developed to achieve improved properties, however much of this work has been done in solution. In order to develop a successful food packaging product, in addition to product value, the process being utilized must use the most economical techniques. Extrusion processing is perhaps the most economical method for processing polymeric materials. Research will be presented demonstrating how extrusion processing affects the properties of zein articles. Extrusion processing at temperatures of up to 140°C can be performed with minimal reduction in product value. Zein can be recycled using extrusion processing to deliver articles with good properties. The impact of temperature and recycling on zein was carried out at temperatures from 100 – 300 °C and up to 7 passes through the extruder at an extrusion temperature of 140°C. Molecular weight, secondary structure, and tensile properties were measured under all sets of conditions. Zein can be altered chemically using reactive extrusion techniques to provide higher valued articles. Solvent resistance and tensile properties were evaluated on the chemically altered zein. The information presented will be of value to scientists and companies interested in utilizing extrusion processing of their biobased materials.

Biography

Gordon Selling is a Lead Scientist working for the United States Dept. of Agriculture's Agricultural Research Service in Peoria, IL since 2003. He received his PhD in Organic Chemistry from the University of Illinois – Urbana/Champaign in 1988. In his current work he performs research on developing new higher value products using corn/soy/pennycress/cotton protein and corn starch. His research focus is on electrospinning chemically modified proteins, chemically modifying proteins using reactive extrusion and producing starch graft co-polymers. Prior to working in Peoria, he worked for E.I. DuPont for 15 years. At DuPont he worked in their spandex fiber business. He worked on developing new polymers and additives that produced higher value fibers.

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