STUDIES OF SOY PROTEIN ADHESIVE PERFORMANCE ON THE EFFECTS OF PH, AMINO ACID GROUP, AND TEMPERATURE

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ABSTRACT

The aim of the work presented in this thesis was to investigate the factors that govern soy protein adhesive.

In this thesis, extracted soy protein and cherry veneer wood have been used as adhesive and adherent. Three kinds of tensile shear strength (dry-, wet- and boiling-tensile shear strength) were tested using an Instron Universal Testing Machine according to American Society for Testing Materials (ASTM) standards. Viscosity of soy protein was investigated using Brookfield Rheometer. The thermal properties of soy protein and cherry veneer wood were carried out using Differential Scanning Calorimetry (DSC) and Thermogravimetric Analyzer (TGA). The interaction of soy protein with cherry veneer wood was depicted using Laser Scanning Confocal Microscope (LSM).

Soy protein 7S and 11S components have higher dry and wet tensile shear strength near their isoelectric point, and gradually decreased as pH shifted to either acidic or basic region. 7S component has more thermal stable and has a wide range of wet tensile shear strength than that of 11S component in the studied pH region because of their structure and conformation difference. This indicated the nature of soy protein was the main factor that affects adhesive performance.

Increasing soy protein side chain hydrophobicity, the wet tensile shear strength increased, but increasing soy protein side chain hydrophilicity, the wet shear strength decreased. The hydrophobicity of soy protein was another main factor that governed soy protein adhesive performance.

The LSM image showed that at higher curing temperature, the interaction of soy protein and carbohydrate was stronger than that of at lower temperature. The wet and boiling tensile shear strength were increased as curing temperature increased. The curing temperature for assembly adhesive and wood was the key factor that dominated soy protein adhesive properties.

This thesis shows interesting results for soy protein fractions as adhesive and provides basic understanding of what are the factors that govern soy protein adhesive performance, and how these factors work. However, further work is needed to optimize soy protein fractions used as an adhesive.