Study of Structure and Molecular Dynamics of Lignin-Reinforced Thermoplastic Starch

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Abstract. Plastic waste is a major environmental problem that can be resolved by replacing petroleum-based plastics with biodegradable materials. One of the promising materials is thermoplastic starch (TPS), which is biodegradable, cheap and produced from renewable sources. However, its use is limited due to low water resistance, poor mechanical properties and changes in structure during storage (retrogradation). In this study, TPS was modified by adding hydrophobic lignin. The structure and molecular dynamics of the prepared TPS/lignin composites were investigated using X-ray diffraction (XRD) and dynamic-mechanical analysis (DMA). The results show that adding lignin restricts chain mobility in the TPS matrix and affects the formation of crystalline structures.