XRD and DMA Study of Biodegradable Blends of Poly(Butylene-Adipate-Co-Terephthalate) and Thermoplastic Starch Compatibilized with Liquid Isoprene Rubber

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Abstract. Plastic waste is a serious environmental problem and the search for eco-friendly alternatives is the topic of the day. One of the promising candidates for this purpose is poly(butylene-adipate-co-terephthalate) (PBAT), which is produced from oil, but is biodegradable and possesses mechanical properties similar to low-density polyethylene. However, its production is expensive. Blending PBAT with thermoplastic starch (TPS), derived from renewable resources, offers a solution by reducing production costs while maintaining the biodegradability of the resulting material. TPS, though, has poor mechanical properties and its structure changes during storage. TPS properties can be modified since they depend on the type, amount and combination of plasticizers used in the plasticization process. PBAT/TPS interaction at the PBAT/TPS domain boundaries can be improved using suitable compatibilizers. This study explores the impact of liquid isoprene rubber containing carboxylic moieties and dicumyl peroxide on the structure and molecular dynamics of PBAT/TPS blends, using X-ray diffractometry (XRD) and dynamic-mechanical analysis (DMA), providing insights into molecular interactions and dynamics for potential applications of the studied materials.

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