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TWO STEP PROCESSING OF POLYETHYLENE AND THERMOPLASTIC STARCH MODIFIED BY REACTIVE EXTRUSION

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Blends of polyethylene and high polar starch are not compatible and several works have been published in this field with the objective of improve their properties. The development of new approaches to increase the compatibility of these polymers continues to be of interest since it is possible to produce partially biodegradable material and increases the use of renewable materials. In addition, starch is a low cost material available from a great diversity of crops in all regions of the world. In this work, blends of polyethylene and thermoplastic starch modified by reactive extrusion (REX) with citric acid were studied. The chemical modification of starch were performed in a single screw extruder L/D 40 with four temperature zones at 95, 120, 120 and 110 °C for zones 1 to 4 respectively. The modified TPS was characterized by infrared spectroscopy (FTIR), water absorption experiments, high-performance size exclusion chromatography (HPSEC), x-ray diffraction, dynamic mechanical analysis (DMA) and mechanical tests. The blends with polyethylene were produced in the same extruder with the following zone temperatures: 100, 120, 120 and 108 °C for zones 1 to 4 respectively. The blends were characterized by FTIR, scanning electron microscopy (SEM) of the fragile fractured surface, by visible microscopy, mechanical tests, DMA and water absorption experiments. The chemical modification of starch allows the preparation of more homogeneous blends with low tendency to the occurrence of surface fracture during extrusion. The morphology of the dispersed phase of TPS in the blends was highly dependent on the extension of the chemical modification. The blends were considered compatible due to its properties, in special mechanical, thermal and water absorption characteristics. This work was supported by the State of São Paulo Research Foundation (FAPESP).