EFFECT OF POLYPROPYLENE GRADE AND CARBOXYLIC ACID ADDITION ON THE SURFACE PROPERTIES OF PP/THERMOPLASTIC STARCH

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Abstract: Although natural polymers are inexpensive and abundant, their properties are far from the commodity polymers, such as polypropylene (PP). The mixture of natural polymers, such as thermoplastic starch (TPS), with a synthetic polymer, may increase the biodegradability of the synthetic fraction. However, the main limitation for the use of these materials is the incompatibility between the hydrophilic TPS and the hydrophobic PP. Thus, compatibilizing agents are used in order to improve the interaction between phases. Some authors have shown the positive effect of the simple incorporation of carboxylic acids, as a substitute for synthetic polymeric compatibilizing agents, on PP/TPS blends properties. The distribution of a third component between the two phases of the blends can be quite complex since several structures can form and must be considered. The objective of this work was to study the influence of the chemical nature of carboxylic acids and polypropylene grade on PP/TPS surface properties. For this, two PPs were used: PP-LF (Polypropylene with Low Melt Flow Index: 3.3g/10min) and PP-HF (Polypropylene with High Melt Flow Index: 40g/10min). And two carboxylic acids: C14 (myristic acid) and C18 (stearic acid). The blends of PP/TPS (70/30) were obtained by Haake internal mixer. Compatibilizing agent amount ranged from 0 to 10% relative to the mass of PP and TPS. After mixing, samples were injection molded. Samples surface was characterized by colorimetric, morphological and contact angle analysis. According to the colorimetric analysis, the PP-LF/TPS blends were clearer and less predisposed to reddening. Blends with C14 presented a* values smaller (less reddish) than the ones with C18. The acid incorporation reduced significantly the brightness. Among acids, C14 was responsible for greater brightness reduction on blends. L* parameter presented an increase when acid content increased from 0 to 10%, from 55.7 to 58.4, for the PP-HF/TPS blends with C14 and 56.6 with C18, originating lighter blends. Contact angle results showed that there is an influence of the type of PP used in the initial contact angle, since, in general, blends with PP-LF present smaller angles than blends with PP-HF. Among acids, blends with C14 presented smaller variations with time, that is, greater stability when compared to C18. Through the SEM images of the sample surface, it was possible to note a migration phenomenon by the acids, even 1 day after injection process.

Keywords: polypropylene, starch, biodegradable, properties