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SOLID STATE POLYMERIZATION PROCESS IN POST-CONSUMER RECYCLED PET: STUDIES OF PROCESS EFFECT IN DIFFERENT FORMATS

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The growing applications of polyethylene terephthalate (PET), mainly in the soft drink market, associated with the lack of adequate management of municipal solid waste (MSW), has caused serious environmental problems in Brazil. As the principal PET application is in blow-moulded packaging, it would be extremely useful if this material could be treated in such a way as to return it to a form suitable to its original purpose. However, during its life cycle PET comes in contact with degrading agents such as oxygen, light, high temperatures, shearing, and water (not only as a residue of the washing process, but also due to short storage periods). These factors cause degradation through chain scission, which results in decreased molar mass of the polymer and, consequently, in intrinsic viscosity, which prevents bottle-to-bottle recycling. However, molar mass increase of recycled polymer can be obtained by solid state polymerization through the reactions of esterification and transesterification. This is done by heating the polymer to below its melting temperature while remaining above its glass transition temperature. At this temperature a slowing of the thermal degradation process occurs, the polymer is further condensed, and the molar mass increases while sub-products are being removed by vacuum application or flushing with inert gas. In this work, the SSP process was evaluated using different shapes of samples (pellets, flakes and power) in post-consumer recycled PET. The SSP process was carried out in three different temperatures (190, 210, 230 ºC) and process time (2, 6, 10, 14 hours). The SSP process was evaluated by intrinsic viscosity, parallel plates rheometry and differential scanning calorimetric. The results shows that the SSP process is efficient in all shapes, however the PET powder showed highest molar mass increase due to its specific surface area and the smaller space for the subproducts diffusion. Key-words: Solid state polymerization, PET, recycling.