Composites from thermoplastic starch, biopolymers and lignocellulosic fibers

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Population and economy growth worldwide have caused an enormous increase in waste production. To minimize this problem, some alternatives are being studied, such as, for instance, recycling of plastic materials and substitution of conventional plastics by biodegradable polymers (Heller et al., 2003; Kim, 2008). Biopolymer materials derived from renewable agricultural resources have focused a great interest in the last few years. In this sense, many different thermoplastic biopolymers have been developed and commercially produced using current levels of technology (Lörck et al., 2000). By means of a extrusion process, blends composed of polylactide(PLA), poly(ε-caprolactone) (PCL) and thermoplastic starch was prepared to conquer the major short comings (brittle and high price) of PLA. The thermoplastic starch was prepared by a extrusion process with glycerol as a plasticizer, native and acetylated starch were used. During extrusion, starch granules are exposed to high temperature and shear and undergo structural changes such as gelatinization, melting and fractionation. The ability to process starch and the resulting physical properties depend on the extent of structural changes of the starch. During gelatinization, starch molecules are released from the granule structure (Gomez & Aguilera). The addition of a plasticizer to gelatinized starch allows free starch molecules to behave in a similar fashion to common thermoplastic synthetic polymers. By the addition of PCL, PLA was tuned from rigid to ductile but its tensile strength was also reduced. In this work, the thermal, rheological and mechanical properties of these blends were analysed using different techniques including tensile tests, DSC, TG, DMTA, SEM. All these results were used to choose the bests blends to incorporate lignocellulosic fiber.