EFFECT OF STRETCHING ON A POLYPROPYLENE MATRIX CONTAINING NANOPARTICLES FOR APPLICATION IN TEXTILES TECHNOLOGY

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Abstract: The use of thermoplastic polymer as commodities like polypropylene (PP) represents adding value to material that is already inserted in the textile industry and among the synthetic fibers has relative competitiveness. PP is a national product, that is very important for the Brazilian industry, and can still be stretched and oriented, fundamental process to produce fibers and oriented films. In this aspect, it was obtained flat films of pure PP in single-screw extruder, which can be submitted to different levels of stress by puller speed rolls. Differences in films were studied by X-ray diffraction (XRD) that allowed to verify the modifications in the crystallinity degree of after the films being submitted to stress, which can generate, in some cases, larger organization of the PP molecules, depending on the puller speed rools of 60, 260 at 460 rpm. Furthermore, the influence of silica (modified with dimethyldichlorosilane-R972 and unmodified A200) was observed in PP at concentrations of 0.5 and 1% w/w. In accordance with the results of differential scanning calorimetry (DSC) it was observed that both silicas acted as nucleating agent, since the crystallization temperature (Tc) was shifted to a value higher than the PP system without nanoparticle. And still, relating these results to the XRD, it was verified that in relation to the concentration of the unmodified silica, we have the effects of the orientation in the organization of the PP. For the silica R972 it was remarked that the dispersion and distribution at 0.5% w/w in the PP matrix has been influenced by the puller speed rolls, and this tendency was seen by time-domain nuclear magnetic Resonance (NMR); the opposite was noted for concentrated systems, due to evidence in crystalline plan, which was unfavorable during the stress film. The thermal stability of the systems did not change significantly during processing with both nanoparticles, as seen by thermogravimetric analysis (TGA). Therefore, the present work evaluated the influence of the silica nanoparticle, in different concentrations, in the PP film under stretching. The properties were evaluated by the results of thermal analyzes (TGA, DSC) corroborate the data of XRD and NMR.

Keywords: Extrusion, silica, polypropylene, nanocomposite