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THE PERFORMANCE OF THE PP/C20A NANOCOMPOSITES PRODUCED IN DIFFERENT EXTRUDERS

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It is fundamental to understand the nature of the chemical affinity between the components, besides several variables that affects the dispersion (orientation, distribution and aspect ratio) of MMT in the PP matrix. In this work, two twin-screw extruders operating with the same maximum torque were used to evaluate how the length and the screw speed may affect the morphology, mechanical and thermal properties of the PP/C15A nanocomposites. Besides, the effect of the use of a MMT/MEK suspension on PP nanocomposites dispersion was also studied. The PP nanocomposites dispersion produced in the extruder with small screw length (Haake) using solvent was superior to those obtained without solvent in the small or large screw length extrusion (Haake or Coperion). Besides, the Haake extruder produced MMT agglomerates lightly more elongated than the Coperion extruder. The crystallization temperature presented a small increment of 4°C, evidencing that the clay layers acted as crystallization nuclei in the PP matrix. The use of a solvent accelerated the initial degradation of PP nanocomposites, but the extrusion type did interfere on this property. Besides, the thermal deflection temperature of the PP nanocomposites increased 12°C independent of used processing route. The storage modulus (at 23°C) of PP/C-15A nanocomposites presented an increase of approximately 30%, independent of the extruder or the solvent used. The use of solvent promoted an increase of 46% in the impact strength of the neat PP. However, the extrusion of PP nanocomposite without solvent in the Haake increased in 15% in the impact strength when compared with the process using solvent. Moreover, the impact strength increased 24% more than for those mixtures obtained in the Coperion extruder. Then, the PP nanocomposites produced in the Coperion extruder presented half of the mechanical performance that those produced in the Haake.