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Synthesis, Characterization and Rheological Properties of Boronoxide, Polymer Nanocomposites

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Abstract : Advances and new discoveries in the field of the material science on the basis of technological developments have played an important role. Today, material science is branched the lower branches such as metals, nonmetals, chemicals, polymers. The polymeric nano composites have found a wide application field as one of the most important among these groups. Many polymers used in the different fields of the industry have been desired to improve the thermal stability. One of the ways to improve this property of the polymers is to form the nano composite products of them using different fillers. There are many using area of boron compounds and is increasing day by day. In order to the further increasing of the variety of using area of boron compounds and industrial importance, it is necessary to synthesis of nano-products and to find yourself new application areas of these products. In this study, PMMA/boronoxide nano composites were synthesized using solution intercalation, polymerization and melting methods; and PAA/boronoxide nano composites using solution intercalation method. Furthermore, rheological properties of nano composites synthesed according to melting method were also studied. Nano composites were characterized by XRD, FTIR-ATR, DTA/TG, BET, SEM, and TEM instruments. The effects of filler material amount, solvent types and mediating reagent on the thermal stability of polymers were investigated. In addition, the rheological properties of PMMA/boronoxide nano composites synthesized by melting method were investigated using High Pressure Capillary Rheometer. XRD analysis showed that boronoxide was dispersed in polymer matrix; FTIR-ATR that there were interactions with boronoxide between PAA and PMMA; and TEM that boronoxide particles had spherical structure, and dispersed in nano sized dimension in polymer matrix; the thermal stability of polymers was increased with the adding of boronoxide in polymer matrix; the decomposition mechanism of PAA was changed. From rheological measurements, it was found that PMMA and PMMA/boronoxide nano composites exhibited non-Newtonian, pseudo-plastic, shear thinning behavior under all experimental conditions.

Keywords : boronoxide, polymer, nanocomposite, rheology, characterization
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