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Effect of OMMT reinforcement on morphology and rheology properties of polyurethane copolymer nanocomposites

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Abstract

The remarkable structural features of organic modified montmorillonite particles (OMMT) enable them to complete their important role in enhancing different properties of polyurethane copolymer with 75 wt.% hard segments (PUC/75). Based on the melt intercalation approach, various amounts of OMMT were incorporated into PUC/75 solution followed by the injection moulding process. It is essential to mention that the synthesized PUC/75 in this work relied on using 1,5-Pentanediol as a chain extender in order to produce a long-term and thermal-stable PUC successfully. The effect of incorporating various loading of OMMT on rheological properties of neat PUC/75 and its nanocomposites was investigated. The structure of PUC/OMMT was studied using X-ray diffraction (XRD) and scanning electron microscopy. Additionally, differential scanning calorimetry (DSC) thermograms were utilized to investigate OMMT effect on the thermal transitions and crystallinity of resultant PUC nanocomposites. Interestingly, the dynamic rheological analysis exhibited a remarkable increase in melt rheology behaviour with increasing OMMT loading compared to neat PUC/75. This could imply a good interaction between the functional group on the surface of OMMT and PUC/75 domains; particularly hard domains, herein the DSC results showed moderate improvement in melt temperature (T_m) of PUC/OMMT nanocomposite. However, a decline in crystalline

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