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EFFECT OF CHEMICAL BONDING OF NANOCCLAY SURFACE MODIFIER AND COMPATIBILIZER ON THE MICROSTRUCTURE DEVELOPMENT AND RHEOLOGICAL PEROPERTIES OF PP/PP-G-MA/ DIAMINE MODIFIED NANOCCLAY

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The aim of the present work was to chemically modify the montmorillonite (MMT) surface via cation exchange reaction by 1,12 diaminododecane in order to provide a chemical potential for MMT to reacting with polypropylene grafted maleic anhydride, PP-g-MA, compatibilizer. The main purpose of doing this process was to promote the melt intercalation as well as enhancement of the interfacial interaction between the modified nanoclay and polymer matrix. PP based nanocomposite samples containing 2 wt% of the Diamine modified nanoclay and compatibilized with PP-g-MA (D-sample) were considered and the results were compared with that of similar nanocomposite sample containing commercial modified MMT, Cloisite® 20A (A-sample). The nanocompoaite samples were prepared by melt blending process in a laboratory internal mixer. The results of FTIR, TGA and XRD confirmed the required cation exchange reaction. The FTIR analysis performed on the D-sample also evidenced that the chemical reaction between the amine groups of modified MMT surface and maleic group of compatibilizer has been taken placed. However, only little increase in d-spacing was observed. The melt linear viscoelastic results obtained for D-sample showed a considerable increased complex viscosity, η^* , and storage modulus, G' , in whole range of frequencies and did not show a pronounced low frequency nonterminal behavior similar to results exhibited by A-sample. The results of transient stress tests performed on the D-sample also, showed stronger stress overshoot than that of A-sample, but with no appreciable stress decay (undershoot). From these results it was concluded that in D-sample, in contrary to A-sample, a 3D network microstructure due to particle-particle and/or particle-matrix interconnectivity can not be formed, but instead, a special microstructure in which nanocaly aggregates with strong interfacial interaction (adhesion) to matrix is formed. This was evidenced by small individual aggregates observed in TEM micrograph.