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MECHANICAL AND RHEOLOGICAL ANALYSIS OF POLYPROPYLENE/POLY (ETHYLENE OXIDE) BLENDS FILLED WITH HYDROXY-MODIFIED NANOCLAYS

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Polymer blends filled with nanofillers are novel hybrid composite materials that combine the merits of nonmaterials (extraordinary properties such as stiffness and thermal stability) with the advantages of polymer blends (processability and low cost). This study evaluates the possibility of improving the compatibility and properties of immiscible polymer blends consists of polypropylene (PP) and poly (ethylene oxide) (PEO) by the incorporation of organically modified nanoclays as additives. The selected nanoclay type is Cloisite 30B, which is organically modified with OH group, thus thermodynamically should have a higher affinity to the PEO phase in the PP/PEO blend. The blends are prepared by melt-blending technique, with fixing the PP/PEO mass ratio at 70/30 but with varying the loading of nanoclays from 0 to 10 wt%. Tensile mechanical testing and rheological testing are used to probe the solid and melt state properties, respectively. Based on mechanical testing results, the young modulus increases considerably with increasing the loading of nanoclay, with a maximum of 35 %increase in young modulus value obtained at 5 wt% nanoclay loading. Interestingly, the elongation at break and the toughness are not negatively affected with the addition of nanoclay up to 5 wt% loading, in contrast to traditional micro fillers. Rheological testing shows the increase of storage modulus of the blends as the loading of nanoclays increases, with clear plateau observed at low frequency range for all nanoclay-filled samples, indicating a pseudo solid-like behavior and the formation of intercalated or exfoliated structure of nanaoclays for the filled samples. These rheological and mechanical results jointly suggest that nanoclay up to 5 wt% loading, in addition to play a conventional role of reinforcing filler, could also play simultaneously the role of efficient emulsifier for PP/PEO blend.