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Grafting of polypropylene with P-hydroxy-N-phenyl maleimide to use it as a coupling agent in preparation of polypropylene/layered silicates nanocomposites

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A series of polypropylenes grafted with P-hydroxy-N-phenyl maleimide (P-H-N-PMM) were prepared by mixing in a laboratory high speed mixer followed by reactive extrusion in a twin screw extruder with different ratio of (P-H-N-PMM) varied from 1% wt up to 4% wt and a fixed percent of dicumyl peroxide initiator. The amount of grafted P-hydroxy-N-phenyl maleimide, the viscosity, the molecular weight distribution and the transition temperatures and enthalpies were measured. The effect of the initial percent of (P-H-N-PMM) on these parameters was characterized. The results showed that the grafting percentage increases by increasing the percent of (P-H-N-PMM) from 1% wt to 3% wt; but by increasing the percent up to 4% wt, the grafting percentage starts to decrease due to homopolymerization of (P-H-N-PMM) during processing. Molecular weight and viscosity decreased with increasing percent of (P-H-N-PMM). Finally, it was found that the melting and crystallization parameters (temperatures, enthalpies) were modified during grafting. The results indicate that the addition, in ratio, from 1 to 3% of polypropylene grafted with P-hydroxy-N-phenyl maleimide [PP-g-(P-H-N-PMM)], can be used as a good compatibilizer or coupling agent in preparation of polypropylene/layered silicates nanocomposites.

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"Reaction induced self-assembly", tracked by small-angle neutron scattering

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When we observe structure formations that take place in the natural World, we notice that self-organization occurs continuously and immediately next to the synthesis reaction. An example is cellulose, which usually exhibits excellent crystallinity via intra- and intra-molecular hydrogen bonding due to its symmetrical molecule structure. It is therefore known to be generally insoluble in solvents such as water. However, this is not true for the microbial cellulose films (called pellicle) created by microorganisms (*Acetobacter xylimun*). Pellicle has a high water content with water making up 99% of the total structure. In other words, it can be denoted that this microorganism has some means of preventing cellulose from crystallizing, keeping it amorphous, and storing a large amount of water in it. Pellicle is thus a supramolecular system assembled by a microorganism. This supramolecular formation process is a continuous self-organizing transition consisting of biosynthesis of cellulose followed by excretion of the cellulose from the bacterium, crystallization, and condensation. The biosynthesis triggers the interplay between the chemistry and physics of the product's self-organization. To track it, we aimed to perform *in-situ* observation in the reaction solution by using small-angle neutron scattering (SANS). In this paper, we discuss living anionic polymerization, solid-phase radical polymerization by radiation processes, cellulose biosynthesis, and artificial synthesis of cellulose by enzymatic catalysis.

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