

SUMMARY AND CONCLUSION

Polypropylene has occupied a prominent position because of its growing commercial applications. However, it has limitations in its end uses due to its lower impact strength, absence of reactive groups, difficulty to dye and its sensitivity to photooxidation. This restricts its uses in several technologically important fields. One way of overcoming these limitations is preparation of blends/composites. But polypropylene due to its high molecular weight, crystallinity and hydrocarbon nature is incompatible with most of the other polymers.

Hence, it needs modification of its original properties before it can be used for blending. Therefore we have synthesised PP-g-butyl acrylate (PP-g-BA) and PP-g-maleic anhydride (PP-g-MAH) and used these graft copolymers for the development of PP/Ny-6 blends.

The synthesis of PP-g-BA, as well as its use as an interfacial agent has not been reported in literature. We have grafted butyl acrylate as well as maleic anhydride on to polypropylene by solution polymerisation technique using benzoyl peroxide as an initiator. The grafted products are thoroughly characterised for their percentage grafting, percentage grafting efficiency, spectral properties, thermal properties, viscosity and contact angle studies. The grafting reactions were highly influenced by various reaction conditions. The grafted products with highest degree of grafting (2.85% for PP-g-BA and 5.36% for PP-g-MAH) were used as compatibilisers for PP/Nylon-6 blends. Several

formulations of different compositions but at similar processing conditions were prepared by melt mixing technique using single screw extruder. The blends were thoroughly characterised for their mechanical properties (impact strength, tensile modulus and strength, flexural strength), Rockwell hardness, heat deflection temperature and water absorption extent. Thermal properties were studied by using differential scanning calorimeter. Scanning electron microscopy ^{was} used to study the phase morphology of the blends at different areas in injection molded samples. Rheometric Dynamic Spectrometer was used to study the dynamic mechanical properties of the blends. From these studies following conclusions are drawn :

1. Butyl acrylate and maleic anhydride can be grafted onto PP by solution polymerisation technique.
2. The maximum percentage grafting (2.85%) for PP-g-BA was observed at 100⁰C, 6 h reaction time, 0.2% (w/v) initiator concentration and 5.0% (w/v) BA concentration.

For PP-g-MAH the highest percentage grafting (5.36%) was observed at 100⁰C, 8 h reaction time 0.1% (w/v) initiator concentration and 1.25% (w/v) MAH concentration.

3. From the SEM study and Molau's test it can be concluded that PP-g-BA and PP-g-MAH do act as compatibilisers, for PP/Nylon-6 blend systems.

4. All the ternary blends PP/Ny-6/PP-g-BA and PP/Ny-6/ PP-g-MAH have higher tensile modulus, tensile strength and flexural strength than binary PP/Nylon-6 blends. For ternary blends the Nielson's model and Kerner's model for perfect adhesion were found to predict the experimental tensile modulus values with precision.
5. All the ternary Pp/Ny-6/PP-g-BA and PP/Ny-6/PP-g-MAH blends were found to have higher impact strength than that for binary PP/Ny-6 blends. The maximum impact strength was attained at optimised concentration of the compatibilisers (4.8%) and at higher concentration of compatibiliser (9.1%) the impact strength was observed to be decreased.
6. The Rockwell hardness values of all the blends were found to be lower than that of Ny-6. However, heat deflection temperatures of all ternary blends were found to be higher than binary blends.
7. The melt flow index of the ternary blends were found to be lower than that of Ny-6 and binary blends.
8. From the DSC analysis, it was observed that in binary blends, the melting temperatures of Ny-6 and PP are not influenced by each other's presence. But in ternary blends, the melting temperatures of PP and Ny-6 were found to be decreased.
9. The percent crystallinity of Ny-6 and PP in all PP/NY-6/PP-g-BA and PP/NY-6/PP-g-MAH blends was found to be lower. However, it remains unaffected in case of binary

PP/NY-6 blends, indicating it as only physical dispersion.

10. From the dynamic mechanical studies, it was observed that in all the ternary blends β -transition peak of Ny-6 shifted to lower temperature and gradually tends to a straight line. However, in binary PP/NY-6 blends, β -transition peak of Ny-6 was observed at its usual position with well shaped curve.

To see the synergistic/antisynergistic effect of BA and MAH, PP-g-(BA-co-MAH) was synthesised and used as a compatibiliser in the PP/Ny-6 blends. The PP-g-(BA-co-MAH) was synthesised by simultaneous grafting of butyl acrylate and maleic anhydride onto PP by solution polymerisation technique using benzoyl peroxide as initiator and previously optimised conditions.

PP-g-(BA-co-MAH) with degree of grafting 4.8% was used as an interfacial agent for the preparation of PP/Ny-6 blend systems. All the ternary PP/Ny-6/PP-g-(BA-co-MAH) blends were prepared by melt mixing technique using single screw extruder and were characterised for their thermal, morphological and mechanical properties.

The properties of these blends show a general trend as PP/NY-6 < PP/Ny-6/PP-g-BA < PP/Ny-6/PP-g-(BA-co-MAH) < PP/Ny-6/PP-g-MAH.

The blends investigated here have a bright future in automobile and other technologically important fields due to their higher impact strength, lower melt flow index and higher mechanical properties.