

Fabrication and Properties of β -Polypropylene/Organoclay Nanocomposites

S. L. Liu^{1*}, S. H. Lim¹, J. H. Zhao¹, M. S. Yong¹ and X. H. Lu²

¹ *Singapore Institute of Manufacturing Technology
71 Nanyang Drive, Singapore 638075*

² *School of Materials Engineering
Nanyang Technological University
Nanyang Avenue, Singapore 639798
Email: sliu@SIMTech.a-star.edu.sg*

ABSTRACT

Nanocomposites of β -PP/organoclay and β -PP/maleated polypropylene/organoclay were fabricated by melt compounding. High purity β -PP matrix was prepared from the α -PP with a β -PP nucleator, which consisted of equal amounts of pimelic acid and calcium stearate. In order to improve the interfacial adhesion between the PP matrix and the clay, maleic anhydride grafted polypropylene (mPP) was used as the compatibilizer. Morphological observations of the nanocomposites by wide angle X-ray diffraction, scanning electron microscopy and optical microscopy were performed. Mechanical properties of both series of nanocomposites were investigated as a function of the clay content by tensile and impact tests. WAXD results indicated the formation of intercalated structures of clay in the composites. Besides, it was also revealed that the relative content of the β -phase in the skin layer of the injection molded sample was reduced from 19.5% in the β -PP to 13.0% in the β -PP/5wt% organoclay hybrids, while in the core section the β -phase was reduced from 89.3% to 82.2%. Both series of nanocomposites with and without mPP showed improved tensile modulus with increasing the clay content. Interestingly, the β -PP/organoclay hybrids showed impaired impact strengths with increasing the clay content, whereas the α -PP/organoclay hybrids were found to have enhanced impact strengths with the addition of clay.