



Effect of matrix plasticisation on the characterisation of polypropylene/clay nanocomposites

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Abstract

The matrix plasticisation, rarely addressed for polypropylene (PP)/clay nanocomposites, might bring some uncertainty in their material characterisation for good mechanical performance. This paper describes such possible negative plasticisation effect from maleated PP (MAPP) by using X-ray diffraction (XRD) analysis, transmission electron microscopy (TEM), differential scanning calorimetry (DSC) and mechanical testing. An amount of MAPP in excess of a certain saturation level is found to adversely affect the mechanical properties of nanocomposites, thus losing its compatibiliser role.

Key words: *Nanocomposites, Nanoclays, Coupling agents, Mechanical properties, Matrix plasticisation*

1. Introduction

Coupling agents are generally used in polymer blending when two incompatible polymers are melt mixed. Such technique becomes also very viable in synthesis of polymer/clay nanocomposites especially since the polymer matrix possesses hydrophobic properties such as polypropylene (PP), polyethylene (PE) while clay is more hydrophilic. The role of maleated PP (MAPP) as compatibiliser has been utilised quite intensively as the suitable compatibiliser between PP and clay to enhance the clay dispersability (Hasegawa *et al.*, 1998; Perrin-Sarazin *et al.*, 2005; Wang *et al.*, 2004). However, the excessive amount of MAPP could potentially worsen the properties of nanocomposites, more playing a negative role of matrix

plasticiser. This study is conducted to evaluate the effect of matrix plasticisation of MAPP on the resulting mechanical properties and the material characterisation of PP/clay nanocomposites.

2. Experimental details

2.1. Materials and sample preparation

PP homopolymer H380F (melt flow index MFI=25 g/10 min) was supplied by Clariant (New Zealand) Ltd and MAPP Exxelor™ PO1020 (MA content: 0.5-1 wt%, MFI=~430 g/10 min) was selected as the compatibiliser from ExxonMobil Chemical (Germany). NANOLIN™ DK4 organoclay (d₀₀₁=3.56 nm), modified with octadecylammonium salt, was obtained from Zhejiang Fenghong Clay Chemicals, Co. Ltd, China. PP/clay