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WIROTE SARAKARNKOSOL : A STUDY OF LOW DENSITY POLYETHYLENE AND POLYSTYRENE BLENDS WITH REACTIVE COMPATIBILISERS. THESIS ADVISERS: PRANEE PHINYOCHEEP, Doctorat de l'Université du Maine, KALYANEE PREMPHET, Ph.D., CHAKRIT SIRISINHA, Ph.D., 174 p. ISBN 974-664-330-4

This study concerned blending of two polymers, low density polyethylene (LDPE) and polystyrene (PS). Compatibilisation of these two components was investigated by an addition of a reactive functional polymer or copolymer and by inducement of reactive compatibilisation.

Various compatibilisers including maleic anhydride grafted low density polyethylene (PE-g-MA), maleic anhydride grafted polystyrene (PS-g-MA), copolymers of PE and PS and various melt flow indices of copolymer of polypropylene and polystyrene (PP-co-PS) were prepared in a twin screw extruder. Chemical structure of the modified polymers and copolymers were analysed by Infrared spectroscopy. Determination of the MA grafting content was carried out by titration with tetramethylammoniumhydroxide using three different indicators, i.e. cresol red, bromphenolblue and phenolphthalein. It was found that cresol red gave the best and reliable result.

Blending of 75:25 LDPE/PS with 1, 3 and 5 phr of the prepared compatibilisers was carried in a twin screw extruder. The reactive functionalities of the PE-g-MA and PS-g-MA could slightly help in improvement of the mechanical properties of LDPE/PS blends. Copolymers of polyethylene and polystyrene prepared using Friedel Crafts alkylation (PE-g-PS), maleic anhydride linkage (PE-MA-PS) and hexamethylenediamine (PE-HMM-PS) resulted in improvement of mechanical properties of the blends particularly the impact strength. Higher loading of the copolymer resulted in higher impact strength. This may be due to the higher % grafting developed between the matrix and dispersed phase found during processing. Addition of PP-co-PS in LDPE/PS blend affected also mechanical properties of the blends. However the enhancement of impact strength of the LDPE/PS blend depended on the MFI value of the copolymers.

Scanning electron micrographs revealed that the blends containing compatibilisers have smaller particle size of the dispersed phase than the uncompatibilised blend. It was assumed that decreasing of the particle size of the PS dispersed phase is responsible for the enhancement of the blend compatibility. The copolymers could affect stabilising the PS dispersed phase and inhibit the coalescence, and hence providing better compatibility of the LDPE/PS interphase.

For reactive compatibilisation, blends containing PE-g-MA and PS-g-MA without diamine compound (EgSMA3), with hexamethylenediamine, HMD (EgSMA3H) and with 4,4'-diaminodiphenylsulphone, DAPS (EgSMA3D) were investigated. It was found that the compatibility of the blends was better than the blends containing functional polymers such as PE-g-MA or PS-g-MA. This may be due to the imide linkage developed during melt blending from the reaction between the anhydride appended polymers and amine functions. Consequently, the mechanical properties could be improved.