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SUPATRA WANGSOUB : A STUDY OF MECHANICAL PROPERTIES OF GRAFTED POLYETHYLENE FIBRES PREPARED BY MUTUAL IRRADIATION IN MONOMER VAPOURS. THESIS ADVISOR : TAWEECHAI AMORNSAKCHAI, Ph.D., SAUVAROP LIMCHAROEN, Dr.rer.nat., KALYANEE PREMPHET, Ph.D. 167 p. ISBN 974-661-542-4

Modification of polyethylene fibres, both isotropic and drawn, was studied. The fibres were subjected to γ -irradiation in the monomer vapour saturated atmosphere. The monomers were methyl methacrylate (MMA) and vinyl acetate (VAc). Gravimetric and spectroscopic analyses confirmed successful grafting for both isotropic and drawn fibres. Isotropic fibres displayed higher percentage of grafting than the drawn fibres. Analysis of surface composition, using ATR-IR, suggested that grafting reaction occurred mostly below the surface for the isotropic fibres and mostly on the surface for drawn fibres. Dynamic mechanical analysis of the grafted fibres indicated that the grafted polymers and polyethylene were phase separated and exhibited their respective relaxations. No grafted fibres were found to contain gel or insoluble fraction. This indicated that no crosslinking or negligible crosslinking was formed during irradiation. It was found that the modification process had no effect on tensile properties of the fibres. On the other hand, a significant improvement in compressive strength, measured by tensile recoil test, of the drawn fibres was found. Vinyl acetate grafted polyethylene fibres were found to have higher compressive strength than methyl methacrylate grafted polyethylene fibres. Examination of compressive failure surfaces, under SEM, of original and grafted fibres showed no difference between the two. The roles of grafted polymers in the improvement of compressive strength of the fibres were discussed and three mechanisms were proposed. These mechanisms addressed prevention of interfibrillar slip, improvement of lateral integrity of the fibre and improvement of energy dissipation by grafted polymer during recoil.