

INFLUENCE OF THERMAL TREATMENT ON POLY(HYDROXYLALKANOTES)S AND THE REACTIVE BLENDS OF POLY(HYDROXYLALKANOTES)S AND EPOXIDIZED NATURAL RUBBER

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ABSTRACT

Poly(hydroxyalkanoate)s (PHAs) are the microbial polyesters produced from fermentation. They are of the interest of scientists and environmentalists due to their wide-ranged combinations of monomers, biodegradability and biocompatibility properties. At temperature above the melting points of poly(3-hydroxybutyrate) (PHB), poly(3-hydroxybutyrate-co-3-hydroxyvalerate) (PHBV) and poly(3-hydroxybutyrate-co-3-hydroxyhexanoate) (PHHx), thermal decomposition of the materials via random scission process takes place leading to shorter chains with terminal carboxyl groups. This study is intended to reveal the influence of thermal treatment on the molecular weight of PHB, PHBV and PHHx. Results from gel permeation chromatography suggest a major reduction of molecular weight up to 50 % of the materials at 180°C for more than 20 min. FTIR spectroscopy shows an increase in absorbance intensity of PHHx after thermal treatment, indicating a formation of more alkenyl and carboxylic end-groups in polymer chains due to random chain scissions. At temperature above the melting points of PHB and PHBV, thermal decomposition of the materials via random scission process takes place leading to shorter chains with terminal carboxyl groups. These terminal carboxyl groups may trigger chemical reactions with the reactive sites in epoxidized natural rubber (ENR). This melt reaction may serve as *in-situ* compatibilization for these immiscible polymer blends. Isothermal melt reaction of PHB and PHBV with ENR were detected at temperatures ranging from 184 to 199 and 220 to 234 °C, respectively. The rate of reaction increases with the increasing isothermal melt reaction temperature (T_a). Merging of the separate glass transition temperatures (T_g) (corresponding to those of the neat constituents) into one T_g may reflect increasing adjustment of the two constituents after melt reaction. The rates of crystallization of PHB and PHBV impede significantly after melt reaction for all blend compositions. Morphology of reactive blends before and after the melt reaction is presented.