Unsaturated Polyester Resins: The effect of different types of initiators on cross-linking process and thermal stability

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Unsaturated polyester resins (UPRs) are the most widely used thermoset resins, with more than 1.5 million tonnes being consumed during 2018 globally, for the production of a wide variety of products [1]. UPRs are obtained by radical polymerization of unsaturated polyesters with unsaturated monomers which act as crosslinking agents. UPRs, also, contain initiators, accelerators which promote the curing process, etc. Thus, the manufacturing process of unsaturated polyester resins evolves different types of chemical reactions, leading to a plethora of industrial applications.

The cross-linking process is the most crucial stage of the UPRs manufacturing, since during that procedure, a three-dimensional network structure is created, urging the resin to be transformed into solid. Several types of initiator systems are used in order to induce cross-linking. The thermal homolytic dissociation of initiators is the most widely used mode, with the most extensively adapted initiator being benzoyl peroxides (BPO) which acts at elevated temperatures. There is, also, another category of initiators, those which induce curing at room temperature, such as methyl ethyl ketone peroxide (MEKP).

The purpose of this study is to deal with the effect of initiator systems (BPO and MEKP) on the curing process of unsaturated polyester resins and on the thermal stability of the corresponding cured materials. The resulting characteristics are revealed by Differential Scanning Calorimetry (both in isothermal and dynamic mode) and Thermogravimetric Analysis.

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