THERMOPLASTIC LIQUID COMPOSITE MOLDING: PRODUCTION AND CHARACTERIZATION OF COMPOSITES BASED ON CYCLIC OLIGOMERS

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ABSTRACT

The main problem during the processing of thermoplastic composites is the impregnation of the fibrous reinforcement with highly viscous resins. Therefore, liquid composite molding techniques are typically associated with thermoset resins. Recently, however, more attention has been paid to in situ polymerization techniques, where impregnation is facilitated by injecting polymeric precursors, which then react to form a thermoplastic matrix. The low viscosity of these precursors allows for the use of liquid molding techniques like resin transfer molding for the production of continuously reinforced thermoplastics.

This paper reports on the production and characterization of glass fiber reinforced poly(butylene terephthalate) based on the in situ polymerization of cyclic butylene terephthalate oligomers. Due to the relatively fast reaction kinetics of the polymerization reaction, the time window for impregnation is quite narrow. This time window can however be broadened by semi-isothermal production. After the impregnation phase, polymerization and crystallization need to be completed in order to reach satisfactory matrix properties. Given that the thermoplastic matrix is polymerized inside a closed mold and in the presence of a preform, the matrix properties, like degree of conversion, molecular weight and crystallinity and their relation to the final composite properties are of particular interest and depending on the preform used. The influence of different preforms on the final composite properties will be investigated.