A PRELIMINARY STUDY OF COMPOSITE REACTION INJECTION MOLDING*

V. M. González, J. M. Castro** and C. W. Macosko

Department of Chemical Engineering and Materials Science
University of Minnesota
Minneapolis, MN 55455

ABSTRACT

A promising method for producing a composite reaction injection molded material, is to place a fiberglass mat into the mold before injection. In this work we examine the behavior of two typical RIM systems, one mixing (polyurethane) and the other heat activated (styrene-based). The effect of a fiberglass mat during filling and curing is analyzed. Theoretical predictions are compared to experimental results for the two RIM systems.

INTRODUCTION

Reaction Injection Molding can be defined as the filling of a mold with an initially low viscosity polymerizing mixture, which solidifies in the mold by means other than cooling [1]. In RIM processes, polymerization can be initiated by two different methods: mixing and heat transfer. For the mixing activated process, two highly reactive monomers or prepolymers are brought into intimate molecular contact by impingement mixing. From the mixhead they flow into the mold and react rapidly to form a solid part. A sketch of the process is shown in figure 1. The mold wall temperature (T_W) is not much different than the starting material temperature (T_0), since the monomers are highly reactive at T_0. Polyurethane and nylon-6 are examples of mixing activated polymerizations.

* To be presented at NSF-US Italy Composites Conference, Capri, June 16, 1981.
** Present address: Planta Piloto de Ingeniería Química, Universidad Nacional del Sur, Bahía Blanca, Argentina.
Figure 1. Schematic diagram of a mixing activated RIM system (ref. [16]).

Figure 2. Schematic diagram of a heat activated RIM system (ref [16]).