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Simulation of the Reactive Rotational Molding Using Smoothed Particle Hydrodynamics

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Abstract : Reactive rotational molding (RRM) is a process to manufacture hollow plastic parts with reactive material has several advantages compared to conventional roto molding of thermoplastic powders: process cycle time is shorter; raw material is less expensive because polymerization occurs during processing and high-performance polymers may be used such as thermosets, thermoplastics or blends. However, several phenomena occur during this process which makes the optimization of the process quite complex. In this study, we have used a mixture of isocyanate and polyol as a reactive system. The chemical transformation of this system to polyurethane has been studied by thermal analysis and rheology tests. Thanks to these results of the curing process and rheological measurements, the kinetic and rheokinetik of polyurethane was identified. Smoothed Particle Hydrodynamics, a Lagrangian meshless method, was chosen to simulate reactive fluid flow in 2 and 3D configurations of the polyurethane during the process taking into account the chemical, and chemiorehological results obtained experimentally in this study.

Keywords : reactive rotational molding, simulation, smoothed particle hydrodynamics, surface tension, rheology, free surface flows, viscoelastic, interpolation
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