SL 2.26

Numerical Simulation of Fiber Orientation in Injection Molding Process

A. Redjeb (a), L. Silva (a), P. Laure (b), M. Vincent (a) and T. Coupez (a)
_(a) Ecole Nationale Supérieure des Mines de Paris, Centre de Mise en Forme des Matériaux,
UMR CNRS 7635, BP 207, 06904 Sophia-Antipolis, France_
_(b) Institu t Non Linéaire de Nice, UMR 6618 CNRS-Université de Nice Sophia Antipolis,
06560 Valbonne, France_

We present a fully three-dimensional finite element method to compute the flow motion and the fiber orientation in the injection molding process. This technique is implemented in the Rem3d software package. The fiber orientation is described by a second order tensor and its evolution is given by the Folgar and Tucker equation. Moreover the coupling between flow and fiber orientation is taken into account by adding a fiber contribution to the stress tensor. The different parameters appearing in this set of equations depend on the shape factor and on the fiber's concentration. Other additional parameters describe fiber-fiber interaction, and various closure approximations can be chosen.

The flow solver uses tetrahedral elements and a mixed velocity-pressure formulation, whereas fiber contribution is solved by decoupling our system, where extra stress is integrated implicitly. The evolution equation is solved by a space-time finite element method, knowing the velocity field. Coupling effect on the orientation state is analysed for different configurations.