Modeling of Polymer Processing of Thermoplastic Polymers: Application to the Injection Molding Process



Autores

Vito Speranza, Sara Liparoti, Giuseppe Titomanlio, Roberto Pantani

Sinopsis

In the transformation operations of polymeric materials, there is a complex interplay between transport phenomena and crystallization. In particular, the polymer in the molten state is a viscoelastic fluid with rheological parameters depending on temperature, pressure, crystallinity, and molecular stretch. The molecular stretch is a tensor variable with values determined by the history of the flow, temperature, and pressure fields. During polymer processing operations, several phenomena proceed simultaneously by interacting with each other. The combination and interplay of the models that describe each of the phenomena mentioned above provides the evolution of all the relevant quantities and, therefore, also the overall model that describes the evolution of the solidification that generally proceeds starting from the walls (where the temperature is lower and furthermore the shear is higher). This work presents an overall model of the behavior of an isotactic polypropylene during the injection molding process. The model includes the kinetics of spherulitic and fibrillar crystallization and their dependence on the level of molecular stretch; the modeling is carried out up to the prediction of molecular stretch and morphology distributions along the molded part thickness. The model predictions satisfactorily describe the evolution of temperature and pressure during the process and the fundamental aspects of the morphology distribution inside the part.

Escanea para ver en línea

E-Book

Presentación: PDF (Digital: descarga y online)

2026 © Sistema Integrado de Metadata Estandarizada desarrollado por Hipertexto - Netizen

VS

Sobre el autor

Vito Speranza

SL

Sara Liparoti

GT

Giuseppe Titomanlio

RP

Roberto Pantani

2026 © Sistema Integrado de Metadata Estandarizada desarrollado por Hipertexto - Netizen