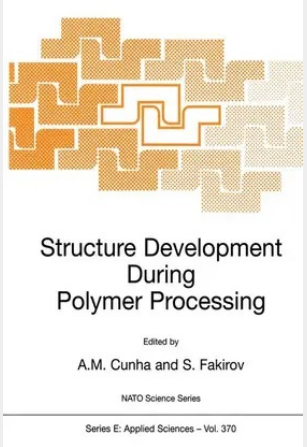
Cunha / Fakirov

Structure Development During Polymer Processing



30 years ago, polymer processing was considered to be a set of operations aiming at imparting a desired shape to the material, while its final properties were defined exclu sively by the molecular structure and architecture resulted from the respective synthetic approaches. These two fields of knowledge - polymer processing and polymer structure - grew closer as several scientific and technological works disclosed the microstructure and other morphological features developed by polymeric systems upon different process ing conditions. Even before the real understanding of the polymer structural details, engineers were able to make use of the effect of molecular orientation and to manufacture polymeric fi bres with enhanced properties in terms of stiffness and strength. However, it was during the 1970s that the scientific community started to relate microstructure development and the thermomechanical environment associated to different processing techniques. Ever since, very important works were done on semi crystalline, amorphous or blended polymers in order to identify and, recently, to predict the effect of the imposed shear fields and cool ing gradients on the final product properties. These efforts led to more accurate process ing methods and stimulated new engineering approaches, such as property enhancement through out-of-the-processing as well as on-line control. Modem processing technology has developed further towards the nano level, enabling impacts on the macromolecular structure.

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