PLEASE NOTE CHANGE IN DAY AND PLACE FOR THIS SEMINAR ONLY

Center for Fluid Mechanics, Division of Applied Mathematics
Fluids, Thermal and Chemical Processes Group, School of Engineering
Joint Seminar Series

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Rheology and Simulation of Flows of Fiber Suspensions

The purpose of this work is to develop a correlation between the transient rheological behavior of rigid (short) and semi-flexible(long) glass fiber reinforced polypropylene and the time evolution of fiber orientation in simple shear in an effort to ultimately model fiber orientation in complex flow. In the case of long fibers (~3mm), it is impossible to use a conventional parallel disk device as the fibers protrude from the disks and cannot follow the curved streamlines. A sliding plate rheometer was designed to measure stress growth in the startup and cessation of steady shear flow. Samples with varying initial orientation were prepared and the stress growth behavior was monitored. Furthermore, samples subjected to varying strains were analyzed for fiber orientation using the method of ellipses. A fiber orientation model that accounts for the flexibility of long fibers, as opposed to rigid rod models commonly used for short fibers, was investigated and results are compared with experimentally measured values of orientation. The results from the basic shear flow experiments are used to obtain parameters in models for fiber orientation, and these are then used in the simulation of fiber orientation in complex flows. Predictions of fiber orientation and configuration are compared against experimentally determined values for complex flows found in polymer processing.

Monday, September 27, 2010
3:00 PM
Division of Applied Mathematics
182 George Street, Room 110