# Polymer Processing Lab 3
## C-Mold Program.

Objectives: To become familiar with a finite element based calculation program for polymer processing, C-Mold.

Background: Section 16.2 on pp. 664, section 16.3 on pp. 669 and section 16.4 on pp. 676 discuss application of finite-element analysis to a simple processing situation, a calandering operation. A parallel approach can be used to model injection molding which is the purpose of a number of commercial softwares of which C-Mold is one example. Injection molding was studied in a previous lab and the relevant sections of Chapter 14, pp. 584 to 624 should be reviewed for this lab.

In using modeling program for an injection molding process a finite element model must be created for the mold. This is done using a CAD program which can be independent of the modeling software. Once a finite element model is constructed, it can be used in the modeling software. An example file of a scotch tape holder is included with C-Mold and we will use this to run through the operation of the program, although in actual use you would have to construct a finite element model of your own.

You should become familiar with the graphical manipulation of the 3-d mold model in the program. This involves various rotations in a Cartesian coordinate system. Once you are able to manipulate the model you should decide on and learn to select:
1) The number of injection ports for your mold cavity
2) The position of these injection ports
3) The type of resin which will be injected
4) The injection temperature for your resin
5) The injection pressure for your resin
6) The flow rate for injection

Once a given set of conditions are selected you should run the calculation which will simulate the formation of a part.

The simulation will show the melt front as it fills the mold. A cartoon sequence for this mold filling operation will be made. You should sketch this operation as well as the temperature distribution, pressure distribution, orientation map, time to fill and suggested improvements to the mold which are the outputs of the C-Mold program. Be sure to rotate the 3-d maps which result from the program to get a good feel for the result of the calculation.

You should try several simulations where you vary the position and number of injection ports and as many of the other parameters as you desire. You should attempt to form weld lines in the mold, demonstrate skin formation at low injection temperatures and try to induce significant orientation in the sample. These are all negative features and the intent is to understand what conditions lead to these features. Notice that multiple injection ports leads to a dramatic drop in the injection time but leads to weak points in the part.

**The write-up for this lab should be fairly short but should include some discussion of what was learned in toying with the C-Mold program especially as it relates to chapters 14 and 16.**