

**Michigan Technological University
Department of Chemical Engineering
CM 4110 Unit Operations Laboratory**

**Packed Bed Reactor Experimental Notes
Sucrose Reaction**

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In this experiment, you will determine the kinetics of the inversion of sucrose in a packed bed reactor at various temperatures and determine the kinetic rate constants. See the handout for information about the theory of this reaction in a packed bed reactor. The reaction will be monitored by reading the optical rotation using a polarimeter.

1. To do this experiment, you are to use a 5 gallon solution containing 15 wt% sucrose.
2. To learn how to use the polarimeter, you make a measurement using distilled water and the 15 wt% sucrose solution. Would any other measurements be useful?
3. You will run the PBR experiment at a total flow rate of 0.0125 gal/min.
 - a. Before you start, be sure to empty the liquid in the B Pure system. Thus, when you start the liquid flow you will have sucrose solution at the desired feed concentration entering the reactor. Also, make sure you bleed out any air that may still be in the B Pure system. Since you cannot empty the fluid out of the cartridges, you will have to monitor the feed density at the flow meter to see if the concentration is changing. After the feed density levels out the feed going to the reactor is your feedstock.
 - b. Your group will determine the reaction rate kinetic constant at three temperatures: 40 °C, 50 °C, and 60 °C.
 - c. Obtain a sample and determine sucrose conversion with the polarimeter every 10 minutes (or as appropriate). Make sure you verify that you have a steady state from consecutive polarimeter data. It is important that you do not have any air bubbles in the tube that you insert into the polarimeter.
 - d. When you are finished, dump all of the remaining sucrose solution. Clean out the B Pure and the process lines with distilled water.
 - e. Be sure to unplug the polarimeter when you are finished.