

Standard Operating Procedure (Microchannel Reactor System)

Facility:	Polymer Reaction Engineering Laboratory Chemical and Biomolecular Engineering Department
Lab Director:	Prof. Kyu Yong Choi
Scope:	This SOP details the use of the Microchannel Reactor system for work in the Polymer Reaction Engineering Laboratory.
Last Revision:	December 1, 2014 by Sangyool Lee

Caution: The Chemicals and equipments used in this procedure are **hazardous and dangerous**.
Always wear heat gloves when handling equipment with high temperatures.
Always wear goggles, (face shield), rubber gloves, apron, closed toed shoes, etc.

System Operating Procedure

1. Turn on heating elements (Hot plate to set reaction temperature):
 - a. Place a large beaker with water and magnetic stir bar on the hot plate.
 - b. Place the thermocouple in the beaker making sure that it is submerged under water.
 - c. Set the desired temperature and RPM (stir bar rotation speed).

2. Turn on circulating baths:
 - a. Set the desired temperature for each of the 2 microchannel reactors by setting the temperature of the circulating temperature baths for each of the reactors.

3. Prepare the high pressure glass reactor and catalyst syringe inside of the glove box:
 - a. Fill the reactor with the required volume of solvent (toluene).
 - b. Add Methylaluminoxane (co-catalyst) and catalyst to catalyst injection syringe.
 - c. Put the reactor top on the reactor and tighten. Make sure that all the valves are closed.
 - d. Take out the glass reactor and catalyst syringe from the glove box.

4. Open the valves in the ethylene gas line except for the last valve before the connection to the reactor.
5. Place the reactor in the high temperature bath and connect the ethylene gas line. Place the catalyst syringe in the syringe pump.
6. Connect the glass reactor to the HPLC pump.
7. Connect the glass reservoir to the outlet of the microchannel reactor system.
 - a. Connect the vacuum to the reservoir to empty the reactor assembly of all gases.
 - b. After sufficient vacuum time, connect the nitrogen gas to the reservoir and set the pressure to the reaction pressure.
8. Turn on the HPLC pump to start the flow of solvent into the microchannel reactor.
9. Start the injection of the catalyst by turning on the syringe pump. Set the flow rate to the desired value.
10. After the reaction is complete, disconnect the reservoir and collect the polyethylene products.
11. Close the valves for ethylene and nitrogen gases.

12. Purge the reactor system:

- a. Add toluene to the glass reactor and connect to the HPLC pump.
- b. Turn on the HPLC pump to purge the reactor.

13. Clean reactors for next use.

Microchannel Reactor System Policy

1. The Instrument is managed by Sangyool Lee. If you would like to use the instrument, come to see Sangyool Lee first. Use the instrument properly as described in the Microchannel Reactor System SOP. If you find something wrong, alert Sangyool Lee immediately.
2. Always wear protective equipment and handle with care when dealing with high temperatures and pressures.