

## Standard Operating Procedure

### Title: FOM Technologies Mini Roll Coater (MRC)

#### PURPOSE

To outline the steps required to safely operate the FOM Technologies Mini Roll Coater (MRC) for slot-die coating of flexible substrates with liquid materials.

#### PRIOR TO BEGINNING WORK

All staff working with the MRC receive instrument-specific training in addition to all other EHS safety training.

#### PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

1. Wear appropriate personal protective equipment (PPE) when performing sections of this protocol.
  - a. Nitrile gloves
  - b. Lab coat
  - c. Safety glasses

#### MATERIALS AND EQUIPMENT

- PPE (nitrile gloves, lab coat, safety glasses);
- Green chemical waste bin;
- Coating material;
- Coating material solvent;
- Appropriate liquid chemical waste bottle;
- Cleanroom wipes;
- MRC with syringe pump;
- Slot-die with spacer;
- 5.5 mm hex key;
- 2.0 mm hex key;
- Heat resistant (green) tape;
- Scissors;
- (2) 12-15 mL Luer-Lok syringe ( $\varnothing$  15.50 mm);
- P-628 Luer adapter female;
- (2) P-330X flangeless nut;
- 1521 FEP tubing;
- (2) P-300X flangeless ferrule;
- P-652 adapter;
- Voltage transformer;

- Extension cord;
- Substrate to be coated.

## PROCEDURE

### A. MRC setup

1. Remove plastic protective sheet from instrument and set aside.
2. Plug male end of extension cord into female socket of the voltage transformer sitting on the floor next to the -80 °C freezer adjacent to the walk-in fridge.
3. Plug the male end of the voltage transformer into the wall next to the -80 °C freezer.
4. Run the extension cord along the edge of the sink and wall to the MRC.
5. Plug the male end of the MRC cord into the female end of the extension cord.
6. Depress both emergency “NØDSTOP” buttons on the front of the roll coater and then press the green main power switch to turn the instrument on.
7. Toggle the drum rotation switch (right toggle switch) to the ON position.
8. Set the desired rotation speed by holding down the “Func.-Speed” key and simultaneously pressing the increase or decrease buttons to adjust.
9. If your coating protocol requires heat, toggle the drum heat switch (left toggle switch) to the ON position.
10. Set the desired temperature using the temperature controller.
11. Set the desired flow rate by pressing the “Rate” key on the syringe pump and using the arrow buttons to set your rate in the indicated units (the default units are  $\mu\text{L}/\text{min}$ ).

### B. Slot die assembly and priming

1. Open up slot die using 2.0 mm hex key and inspect the inner surfaces for dust and other residues. Clean with the appropriate solvent if dirty.
2. Reassemble the slot die head using the 2.0 mm hex key.
3. Assemble tubing and fittings in the following order:
  - i. Insert each end of the 1521 FEP tubing into a P-330X flangeless nut.
  - ii. Attach to each end of the 1521 FEP tubing a P-300X flangeless ferrule.
  - iii. At one end of the assembly screw on a P-628 Luer adapter.
  - iv. At the other end of the assembly screw on a P-652 adapter.
4. Fill a Luer-Lok syringe with half air and half coating material solvent.
5. Connect the tubing assembly to the syringe
6. Connect the other end of the assembly to the slot die head.
7. Hold the syringe vertically so that the solvent is in the bottom half of the syringe.
8. Purge the slot die head with coating material solvent by depressing the syringe plunger completely.
9. Fill a separate Luer-Lok syringe with the coating material.
10. Attach this syringe to the tubing assembly.
11. Prime the system by depressing the syringe plunger until some of the coating material exits the slot die.

### **C. MRC operation**

1. Attach the slot die to MRC using the mounting bolt and 5.5 mm hex key.
2. Place syringe containing coating material into syringe pump.
3. Attach substrate to coating drum using heat resistant tape, aligning the left edge of the substrate with the left edge of the coating drum.
4. Ensure that substrate lays flat against the coating drum.
5. Start the drum rotation and clean substrate surface with nitrogen or air.
6. Stop the drum rotation so that the start of the substrate is aligned with the slot die.
7. Confirm that the slot die is set to rotate in the forward direction by pressing the "ENTER-F/R" key.
8. Align the slot die using the x-axis adjustment knob so that it sits over the correct spot on the substrate.
9. Lower the slot die head using the z-axis adjustment dials so that it sits flat against the substrate.
10. Start the flow of the coating material by pressing the "Start-Stop" button on the syringe pump.
11. When the coating material makes full contact with the substrate across the length of the slot die, raise the slot die ~1-2 mm using the z-axis adjustment dials and start the drum rotation by pressing the "START" button on the roll coater.
12. Approximately 15 cm before reaching the end of the substrate stop the flow on the syringe pump by pressing the "Start-Stop" button and raise the slot die head clear of the substrate using the z-axis control knobs.
13. Once dry, remove the substrate from the coating drum.
14. Remove the slot die head using the 5.5 mm hex key.

### **D. MRC shutdown**

1. Ensure both heat and drum rotation switches are toggled to the OFF position.
2. Depress both "NØDSTOP" buttons to shut off the MRC.
3. Unplug the extension cord from both the MRC and the voltage transformer and store in an appropriate location.
4. Replace protective plastic sheeting over the MRC.

### **E. Slot die cleanup**

1. Repeat as many times as necessary steps B (4-8) to purge the slot die head of coating material.
2. Open up the slot die head with the 2.0 mm hex key
3. Using cleanroom wipes and coating material solvent, clean the inner surfaces of the slot die and spacer.
4. Ensure slot die is dry and reassemble.