**Hazard and Operation Procedures for Polymer Solution Preparation**

**Experiment Procedure:(for 2ml of 4.5% by weight solution)**

1. For vials to be used for general polymer solutions, rinse with toluene from solvent squirt bottle and then with ethanol from solvent squirt bottle, while making sure all solvent waste is disposed in the non-halogenated organic waste bottle.
2. Dry the vial and its like overnight in the glassware drying oven
3. Accurately weigh the required amount of polymer into a dry clean vial.
4. Using a micropipette, add solvent (generally p-xylene, chlorobenzene, or toluene) to the vial and close the lid and weigh it. Repeat if more solvent is needed until target concentration is reached.
5. Use a hot plate stirrer to prepare a beaker water bath at 80oC. Using a stand clamp hold vials submerged to appropriate height for 30 minutes

**List of main chemicals involved in this procedure:**

* Ethanol
* Toluene
* Polymers such as polyolefins, polythiophenes and polyfluorenes
* P-xylene
* Tetrahydrofuran (used for cleaning)

**Potential Hazards, Consequences and Safeguards**

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| **Potential Hazards** | **Consequences** | **Safeguards** | **Actions** |
| Contact or inhalation of chemicals | May cause burning, damage to eyes or other health problems | Always use gloves, safety glasses and lab coat when handling chemicals. Operate in fume cupboard when handling volatiles such as toluene. | Read and follow all MSDS sheets. |
| Breaking of glassware | Cuts to skin or eyes | Covered footwear, lab coat and glasses | Be cautious when handling glassware |
| Hot surfaces | May cause burns in contact with skin | Covered footwear, lab coat, heat resistant gloves. | Turn off heat source, apply cool water to burned skin and seek medical attention. |
| Spillage | Slipping may cause injury such as bruising or fracture | Use containers with higher capacity than the solution needed to carry. Avoid vigorous stirring and use secondary containment trays for overflows. Decant aliquots of main solvents into smaller vessels to minimize the volume of a potential spill. | Clean immediately any small spills using paper towels. For larger spills, pour on the spill kit, open the fume cupboard sashes, and ask everyone to leave the lab until the solvent evaporates. Avoid stepping on wet surfaces. |
| Heating closed vessels of solvent | Rapid heating above the boiling point of the solvent could cause explosion | Use small volumes of solvent in large vials; always heat solutions in a water bath and ensure the vial does not contact the bottom surface | Close the fume cupboard; turn off the powerpoint for the hot plate; and wait to clean the broken glass and water until the system is cool and the solvent has evaporated |

**Hazard and Operation Procedures for Silicon Substrate Preparation**

**Experimental Procedures:(for 1 cm2 silicon wafer substrate)**

1. On a clean dust free surface like the matte side of aluminium foil, cut silicon wafer using a diamond tipped pen into 10 x 10 mm pieces.
2. While holding from the edges, clean the substrate with toluene, ethanol, then deionised water and dry using a nitrogen gun.
3. Place cleaned wafer into UVO chamber, shiny side up, for 30 minutes to clean the surface and use samples immediately after to avoid adsorption of ambient species onto the clean surface.

**List of main chemicals involved in this procedure:**

* Ethanol
* Toluene

**Potential Hazards, Consequences and Safeguards**

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| **Potential Hazards** | **Consequences** | **Safeguards** | **Actions** |
| Contact or inhalation of chemicals | May cause burning, damage to eyes or other health problems | Always use gloves, safety glasses and lab coat when handling chemicals. Operate in fume cupboard when handling volatiles such as toluene. | Read and follow all MSDS sheets. |
| UV radiation | May cause burning, damage to eyes or other health problems | Use gloves, lab coat and UV coated safety glasses.  | Secure close the UVO chamber when in operation. Turn off UVO apparatus and seek medical attention. |
| Wafers with sharp edges | Cuts to skin or eyes | Covered footwear, lab coat and glasses | Handle wafers carefully using tweezers |

**Operation and Shut-Down Procedures for Spin Coater**

**Experimental Procedures:**

1. Before using spin coater, turn on fume cupboard, plug the spin coater into socket and turn on, turn on vacuum and nitrogen supply
2. Open spin coater and place small o-ring on the stage then place substrate on o-ring
3. Close spin coater and turn on vacuum
4. Open and slightly tap the substrate to ensure the proper suction-holding on the chuck.
5. Set rpm and spinning time specific to substrate
6. Pipette sample onto substrate carefully
7. Close the spin coater
8. Press run
9. (alternately - Pipette sample onto substrate through hole in the lid of spin coater)
10. After run, turn off vacuum, open spin coater and remove sample
11. Remove o-ring and place a large enough petri dish over vacuum hole to protect during cleaning
12. Clean the spin coater using chlorobenzene on a tissue paper.
13. Leave tissue paper in fume hood to dry
14. Turn off air, nitrogen and vacuum. Turn off and unplug spin coater. Leave fume cupboard on

**Emergency shut down procedures**

* Turn off spin coater at wall
* Turn off vacuum, nitrogen and air supply

**List of main chemicals involved in this procedure:**

* Chlorobenzene
* P-xylene
* Poly-3-hexylthiophene (P3HT)

**Potential Hazards, Consequences and Safeguards**

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| **Potential Hazards** | **Consequences** | **Safeguards** | **Actions** |
| Contact or inhalation of chemicals | May cause burning, damage to eyes or other health problems | Always use gloves, safety glasses and lab coat when handling chemicals. Operate in fume cupboard when handling volatiles such as toluene. | Read and follow all MSDS sheets. |
| Mechanically rotating apparatus | May cause injury if touched | Use gloves, lab coat safety glasses and covered footwear. | Secure close the lid when the spinner is operating; do not override the safety lock |
| Wafers with sharp edges | Cuts to skin or eyes | Covered footwear, lab coat and glasses | Handle wafers carefully using tweezers |