Methylene Chloride (Dichloromethane) Safe Operational Procedure
Innovation Workshop and Microfluidics Lab
Last Edited: Bassari 2/9

Location: Chemical Storage Cabinet 1, Microfluidics Lab.

Safety Concerns:

- Methylene chloride is a **hazardous chemical** with documented acute and chronic effects as well as mutagenic and developmental toxicity. Please follow these safety instructions closely to avoid any hazards.
- Personal Protective Equipment: When handling Methylene chloride, always wear **"Silver Shield", polyvinyl alcohol, Viton, or "Barrier" gloves**. Note that regular latex or nitrile gloves are susceptible to being permeated by methylene chloride.

- As with all other lab operations, **safety glasses** must be worn during work. A lab coat must be worn when working with chemicals.
- To limit airborne exposure to the chemical, all operations with methylene chloride must be carried out in a functional **fume hood**. As with other fume hood procedures, lower the sash as much as possible.
- This chemical is very volatile, so keep in a **well-sealed** container in a cool, dry, ventilated area.

Overview of Procedure: Use of methylene chloride at the innovation workshop and the microfluidics lab is only permitted for bonding of acrylic. Dichloromethane acts as a chemical solvent that dissolves acrylic locally. This can be used to bond two sections of acrylic together by chemically "welding" them.

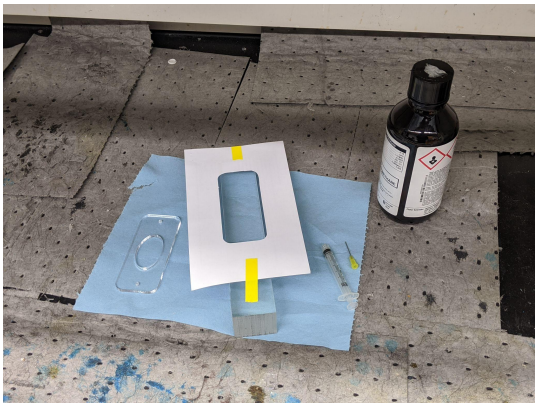

Fig. 1: Work must be done in a fume hood.

Sequence of Operations:

1) Wear appropriate gloves, lab coats and safety glasses.
2) Move the bonding package (methylene chloride, glass syringe with small dispense) and your parts into a fume hood.

3) Line your work area with shop towels or similar cover.
4) Clean the bonding surfaces in your parts - remember that IPA should not be used with acrylic.
5) Using the syringe, draw a small volume of dichloromethane from the container. Quickly seal the container. Carefully apply some adverse pressure to the syringe to keep the solvent from spontaneously leaking.
6) Insert the dispenser via the luer lock on the syringe.
7) Press the two parts together in the position that they should be joined. Uniformly apply some pressure (preferably using a weight) on the parts to keep them in contact.
8) Apply methylene chloride to the edges of the parts. If the pressure applied to them is appropriate, the capillary action between the plates will suck the solvent in and cause the parts to bond together. If the adhesive is not readily leaking into the gap between the parts, reduce the applied pressure.

   Caution! Methylene chloride is very thin, making it difficult to apply the adhesive to small regions. It is recommended to practice this procedure before using it on critical surfaces.

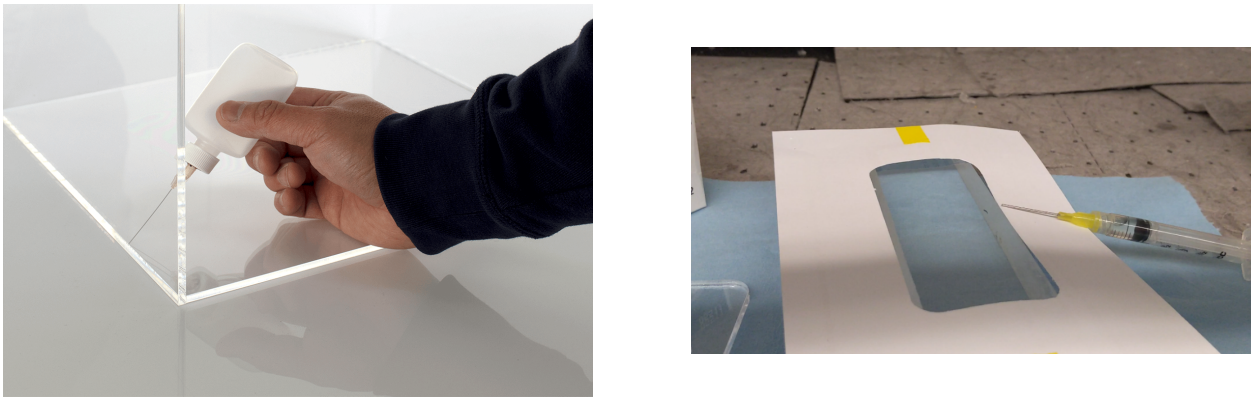

Fig. 2: Application of methylene chloride to joints via capillary action.

9) An alternative approach is to place the one part on the working surface, apply several drops of methylene chloride, and press the second part on top to melt the plastic pieces together.

10) Leave the joint for about a minute before moving it. The full cure strength will be reached within 24-48 hours.

A Note on Laser Cut Acrylic Sheets:

Laser cutting exposes the material to sharp temperature gradients, which, in turn, induces internal stresses. Chemicals like dichloromethane and IPA permeate the acrylic, creating microcracks that expand by this stress. This causes crazing on the parts. To prevent this problem, it may be helpful to anneal the sheets at 180F for roughly 1 hour per mm of thickness.