# Printed Circuit Board Fabrication

NIAGARA COLLEGE TECHNOLOGY DIVISION

# Required Materials

- Safety Glasses, Lab Coat and Nitrile Gloves
- MG Chemicals Positive Presensitized Copper Clad Printed Circuit Board (PCB)
- PCB Fabrication Chemicals

# Safety and Protection

- You must always wear Safety Glasses when working with chemicals.
- Lab coats are provided to protect your clothing when working with chemicals.
- Powder-free Nitrile Gloves are provided to protect your hands from exposure when working with chemicals.
- If your glove becomes torn or punctured, dispose of appropriately and replace with a new one.

# MG Chemicals Printed Circuit Board

- FR4 laminate with 1 ounce of copper per square foot
- FR4 is a flame retardant laminate that is translucent and made of woven glass cloth impregnated with epoxy resin.
- 1 ounce of copper equates to a thickness of 1.34mil or 0.00134" or 0.0341mm or 34.1 microns.
- The copper has a positive presensitized coating which allows for the transfer of positive images to the circuit board.
- The coating is green in colour and also protects the copper from oxidizing.  It dissolves with heat.

# PCB Fabrication Chemicals

- To develop and etch the PCB we need to use chemicals.
- MG Chemicals Developer (#418) – concentrated formula that is mixed 10:1 (10 parts water to 1 part developer) to develop the PCB after being exposed.
  - Sodium Hydroxide 4-10%
  - De-Ionized Water 90-96%
- Etchant – An Oxidizing agent that is used to remove unwanted copper from the PCB.
  - Sodium Persulfate
  - Mercuric Chloride

# PCB Fabrication Chemicals

- MG Chemicals 418 Developer MSDS
- Sodium Persulfate MSDS (Etchant)
- Mercuric Chloride MSDS (Etchant Activator)

# PCB Fabrication Procedures

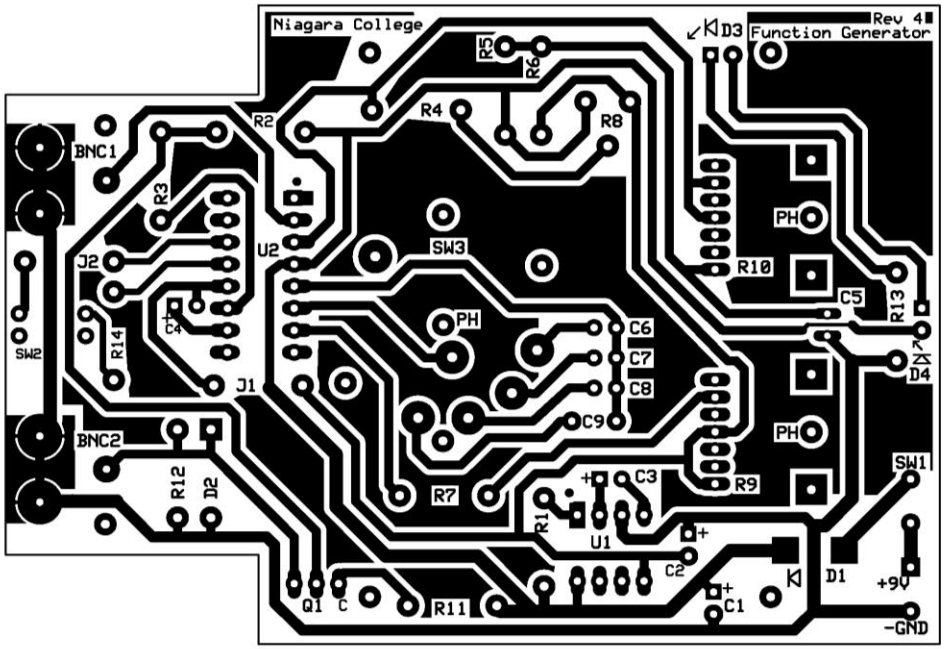
- The following procedures are to be completed in the darkroom in V16 under yellow light. The yellow light is UV safe and prevents inadvertently exposing the PCB.

1. Put on safety glasses, lab coat and gloves.
2. Turn on the Etcher to warm up. The Power and Heater lamps should be lit.

# PCB Fabrication Procedures (cont.)

3. Mix the MG Developer with lukewarm water into a glass tray. (Recommend room temperature water)
4. Put water into a second glass tray to use as a stopper for the developer.
5. Obtain an MG Chemicals Positive Presensitized Copper Clad PCB #609 (6” x 6”) from instructor.
6. Open the PCB package by removing the tab and making sure that no staples remain in the bag.

# PCB Fabrication Procedures (cont.)




7. Place the artwork face down on UV exposure frame (**text on the transparency will appear backwards**).
8. Slowly peel back the white protective coating from the PCB avoiding contact with the green surface. The protective coating can be damaged if exerting too much force on the board. Also, be careful not to let the coating touch back on the surface as it can also be damaged.

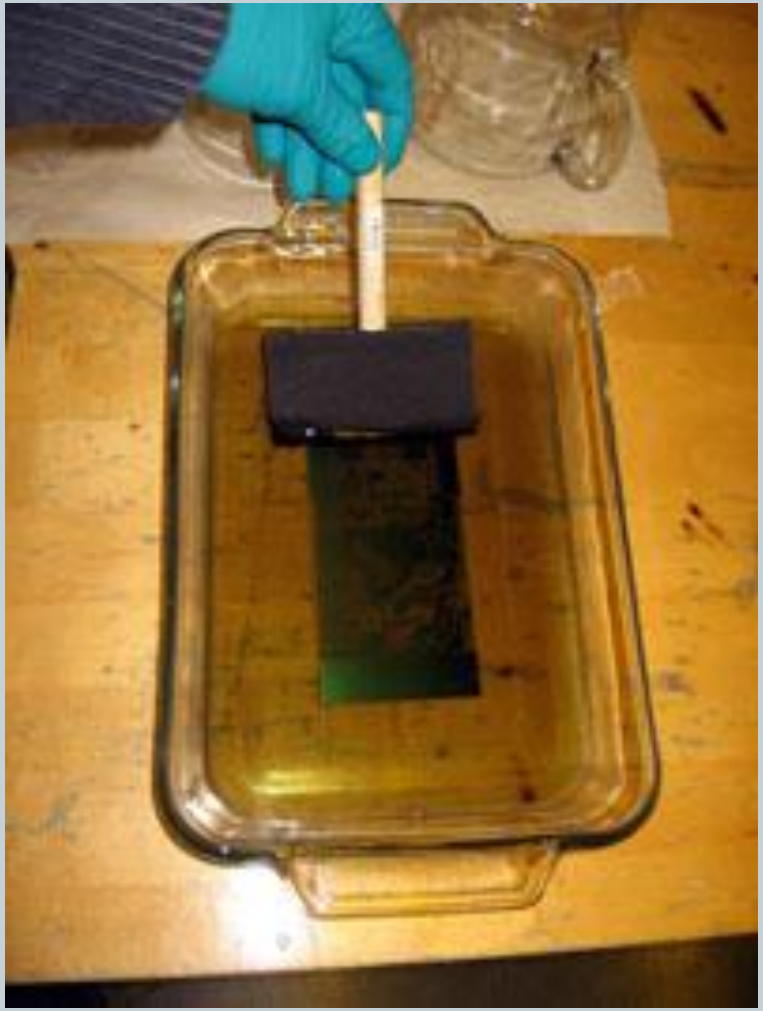
# PCB Fabrication Procedures (cont.)

9. Place the PCB, presensitized side, down on the artwork using the alignment guides.
10. Close the exposure frame lid down on the PCB.
11. The controls should be set for 5 lamps, timer mode. Set the timer for 1 minute, this turns the lamps ON to expose the PCB with UV light. A bell will ring when the timer is finished and the lamps will turn OFF. Anything that is exposed by the UV light will be removed by the developer.

# PCB Fabrication Procedures (cont.)

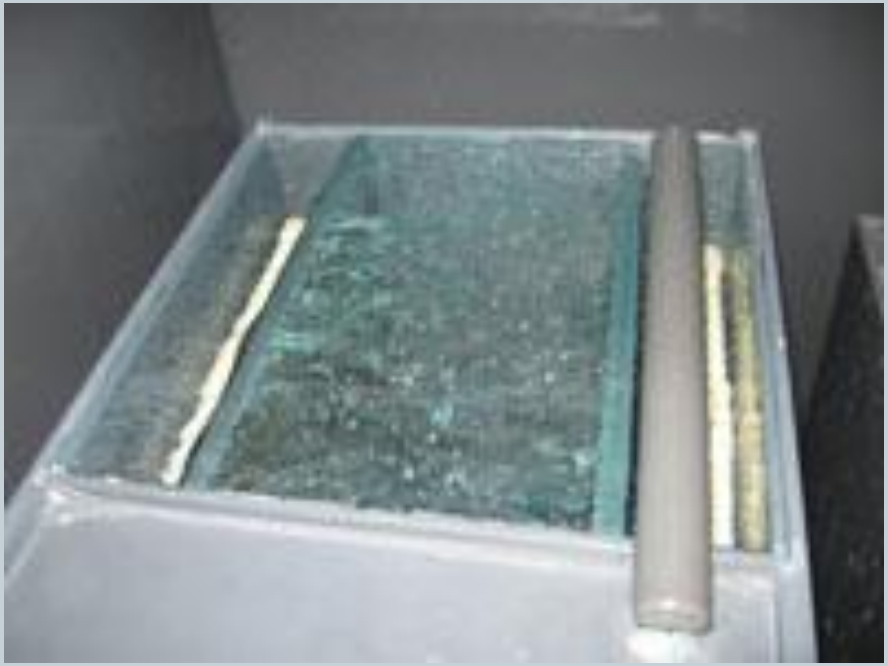
# PCB Fabrication Procedures (cont.)

12. Remove the PCB from the exposure frame and place it copper side (green) up in the developer in the glass tray.
13. Using a foam brush, **lightly** brush from one end of the PCB to the other, moving back and forth ensuring coverage of the entire PCB. Monitor the developing processes until the traces appear crisp and clear. The circuit layout will appear as the developer removes the exposed coating.
14. Remove the PCB from the developer tray and place it in the water tray to stop the developer.



# PCB Fabrication Procedures (cont.)

15. Attach the PCB into the hanger for the etcher using the thumb screws. For efficiency, we will attach two PCB's back to back in a hanger. **TIGHTEN screws!**
16. The hanger is placed into the etcher and the glass lid is put in place.
17. The etcher controls are located on the right side. Turn the timer on the etcher to 5 minutes. The Pump will turn on and start spraying etchant on the PCB's. Etching times vary depending on how many boards have been etched, how much copper is in the etchant and age.



# PCB Fabrication Procedures (cont.)

18. If the PCB is left in the etcher for too long, it will remove **all** of the copper from the board.
19. When the etching process is finished, remove the PCB and rinse it thoroughly with warm water. Using paper towels, you can wipe the component side (non-copper) of the board dry and pat dry the copper side. Be careful not to rub the copper side of the board as it can damage the protective coating.
20. Inspect the PCB to ensure there are no defects. It is now ready for trimming and drilling.