Safe Operating Procedure (SOP) for Tungsten Etchant

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Product name: Tungsten Etchant

Contains: tripotassium hexacyanoferrate(III) + KOH

Appearance: Liquid, Colorless dark yellow

Selective etchants for tungsten thin-film metallizations used in semiconductor and microelectronics technology. Etchants are buffered, mildly alkaline ferricyanide-based formulations providing high-resolution patterns with minimal undercutting and photoresist compatibility. Etchant is ready to use (no dilution required). Controlled, uniform etching is achieved by immersion or spray etch technique. Etch Capacity (rate declines at ~70%) of 64 g/gallon.

Precautionary statement(s) for safe use:

- Wear protective gloves/eye protection/face protection when using tungsten etchant.
- Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.
- Use personal protective equipment. Avoid breathing vapors, mist, or gas.
- Only use inside a fume hood, with the sash closed.
- Use a dedicated beaker for etching.
- The solution should be warmed on a hot plate inside a fume hood.
- Recommended operating temperature is 20-80°C (30-40°C most common). Select your etching method according to the table below:

Temperature (°C)	Etch Rate (Immersion)	Etch Rate (Spray)
20°C	30 Å/second	80 Å/second
30°C	140 Å/second	---

60°C	250 Å/second	---

- Keep the etchant container tightly closed in a dry and well-ventilated place (use Parafilm to ensure it's sealed). Keep the etchant container in the blue acid cabinet in the etching room.

Disposal considerations:

- Waste material must be disposed of in accordance with the national and local regulations.
- **<u>Do not pour the used etchant into the fume hood drain.</u>** Use a correctly labeled waste bottle for disposal.
- Leave chemicals in original containers. No mixing with other waste.
- Dispose of contents/container to an approved waste disposal plant. Use a dedicated bottle for disposal and label the bottle properly.

Application:

Tungsten etchant should be used to etch tungsten films only.

Where to use?

MPTS must be used under a fume hood. It will be used in the Etching Room in the G2N lab, in the fume hood.

PPE required:

To work with MPTS, one must take all personal precautionary equipment, listed as below:

1- Acid gloves.
2- Goggles and a face shield must be used.
3- Apparel should be used to ensure no spillage on the user.

How to use?

The dedicated beaker should be filled with the tungsten etchant and put on a hot plate, all in the fume hood. A separate beaker filled with DI water at room temperature should also be prepared for quenching and washing the etched sample.

After the process is completed, the etchant beaker must be kept inside the fume hood to cool down to room temperature. The cooled-down etchant should then be transferred to its bottle and kept inside the ACID cabinet in the etching room. Both beakers should be rinsed and cleaned with DI water while wearing all PPEs. Contaminated wipes will be thrown away in the ACID garbage beaker inside the fume hood only.

In case of spill:

In case of a minimal spill, use wipes to absorb the chemical off the floor or wet bench and dispose of contaminated wipes in the ACID garbage beaker inside the fume hood.

In case of a significant spill, first, check your PPE and ensure you are not contaminated. If the etchant is spilled on your garment, take the garment off and follow the safety protocols. If the chemical is spilled on your garment and also your clothes and skins, follow the safety protocols, take your garment and contaminated clothes off and use the shower.

If the spill is on the floor, keep calm, use chemical spill absorbent pads (located in the spill kit in the green cabinet in the hallway) or wipes; let your safety buddy know of the accident. Inform staff.