TCR® Thin Film Embedded Resistor Foil
Etching Solution Analysis Guideline for HCl/Glycerin

TECHNICAL BULLETIN

Nickel Chromium and Nickel Chromium Aluminum Silicon can be selectively etched with either acidic permanganate followed by a neutralizer or Hydrochloric acid with glycerin stabilizer. These chemistries must be maintained for optimum etching and to ensure complete removal.

What to Consider

The first consideration is ensuring proper chemistries are available for performing the analysis. Make sure the proper chemicals are used and containers are marked appropriately.

The second consideration is the proper equipment for performing the analysis. Equipment should be in good working order and calibrated prior to making measurements on sample solutions.

The final consideration is to ensure the working environment is clean and safe. Be sure to wear proper safety attire before performing an analysis.

Conclusions

Analysis of chemical constituents is necessary for maintaining and controlling of the etching and neutralizing solutions. A well maintained bath can yield consistently etched product and decrease process variation.

Other chemistries are known etchants of copper and nickel chromium aluminum silicon. When using other chemistries to remove copper and nickel chromium aluminum silicon other than recommended above, consult the Ticer Technologies Technical Marketing Research or Research & Development.
**Hydrochloric acid – glycerin etch solution**

**Recommended method to determine HCl concentration**

HCl concentration can be determined by standard titration method. The HCl concentration in HCl-glycerin etching solution is 188.34 gram/liter. (43 v/o HCl (concentrated 37%) = 188.34 gram/liter)

**Procedures:**

1. Take 2 ml of etching solution and place into a 100mL beaker
2. Add approximate 50 milliliter DI water into the beaker
3. Use 1.0 N NaOH solution to titrate the solution to pH=7 by using a pH probe
4. Record the volume of 1.0 N NaOH used, Vt milliliter
5. Calculate HCl concentration by using the following equation

   \[
   \text{HCl (gram/liter)} = 1.0 \times \text{Vt (milliliter)} \times 36.5 \text{ (gram/mole)} / 2 \text{ (milliliter)}
   \]

For example, if you use 9.9 milliliter 1.0N NaOH to titrate the solution to pH = 7, then the HCl concentration is

\[
\text{HCl (gram/liter)} = 1 \times 9.9 \times 36.5 / 2 = 180.67 \text{ gram/liter}
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