



**Ticer Technologies**  
2555 West Fairview St. Suite 101  
Chandler, Arizona USA 85224  
Tel: (480) 223-0890 Fax: (480) 782-1720  
www.ticertechnologies.com

## **TCR<sup>®</sup> 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,  $V_t$  milliliter
5. Calculate HCl concentration by using the following equation

$$\text{HCl (gram/liter)} = 1.0 \text{ (mole/liter)} \times V_t \text{ (milliliter)} \times 36.5 \text{ (gram/mole)} / 2 \text{ (milliliter)}$$

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

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



---

The information in this process guideline is intended to assist you in processing Ticer Technologies embedded passive materials. It is not intended to and does not create any warranties expresses or implied, including any warranty of merchantability or fitness for a particular application. The user should determine suitability of Ticer Technologies materials for each application.

TICER Technologies service mark is owned by Ticer Technologies, L.L.C., Chandler, AZ.  
TCR is a registered trademark owned by Nippon Mining & Metals Co., Ltd., Tokyo, Japan.  
Revised 02/09 Technical Bulletin #06-0001  
© 2006 Ticer Technologies