

Area of use

Cr-etch-210 is an alkaline etchant for Cr. The etchant is used for the wet-chemical patterning or removal of thin Cr layers with selectivity to metals like Au, Sn, Pt, Cu, Ni, Ti, Ta. Common areas of use are for semiconductor fabrication or microsystem technology, e.g. for the removal or patterning of a Cr barrier or adhesion layer in a plating seed stack.

Advantages and Requirement Profile

Cr-etch-210 is compatible with common resist, shows very low undercut (in the dimension of the layer thickness) under a resist mask pattern and offers selectivity to numerous materials.

Cr-etch-210 is specialised for the patterning of Cr layers using resist mask patterns. For applications without photo resist mask, e.g. for the removal of seed layers after plating process steps, Cr-etch 200 is preferred. Cr-etch-210 is available in different purity grades. The etchant can be used at room temperature and is easy to handle. Etching rate can be increased by increasing the temperature up to 40 °C.

Cr-etch-210 fits to the following requirement profile:

- Low undercut (in the range of the layer thickness), minimum feature size < 1µm
- Selectivity to many materials, e.g. common metals used in electroplating industry
- Available in different purity grades
- Compatible to resist mask
- Use at room temperature
- Increase of the etching rate by increased temperature up to 40 °C

Inteded Use

- Usable for manual process, tank or etching equipment
- Use in laboratory or production environment only
- Use for commercial application only

Selectivity

Cr-etch-210 is compatible/etches selective to following materials:

- Resists: common Novolak as masking resist (e.g. AZ[®] Photoresist)
- Metals: no attack on Au, Sn, Pt, Cu, Ni, Ti, Ta; TiW with limitations
- Semiconductor materials: Si, SiO₂, Si₃N₄ (further information on request)

Etching rate / capacity

Under normal condition, the etching rate is around 10 to 15nm/min at 40 °C (accordingly lower at room temperature).

A sputtered 30nm Cr layer is etched in about 180 seconds. The mixed etching solution is stable over time and can be used multiple times depending on the requirements of application. It is recommended to dispose the solution at the latest, when the etching rate has changed by 20%.

Order number / Article number/ Shipping form

Cr-etch-210 is shipped ready for use.
As a standard, all compounds used are level „extra pure“.

Order number: Article number + Container-Code

	Article number	Container-Code			
		1l	5l	10l	20l
Cr-etch-210 (ready-to-use)	101210-40	D	F	G	H

On request: - Certificate of Analysis with individual requirements regarding elements
- etching solution in other purity grade or special grade regarding specific elements

Mixture

Cr-etch-210:
The solution is shipped ready for use.

Etching conditions

Temperature: 20°C – 40 °C
Tank: Tank for batch process, Petri dish for manual application
Agitation: medium;
Circulation; stirring bar; autom./ man. agitation of work piece
Etching rate: 15 nm per minute (at 40 °C)
Pretreatment: where applicable descum / oxygen plasma for improving the wetting properties of resist or metal mask (no wetting agents needed)

Etching result / inspection

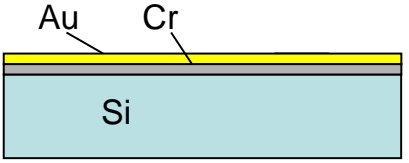
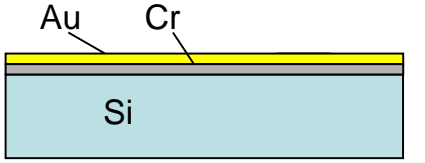
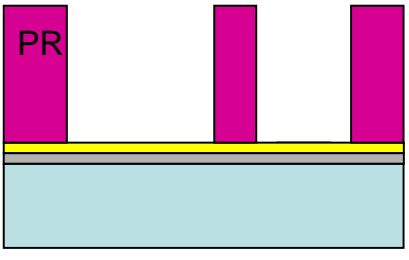
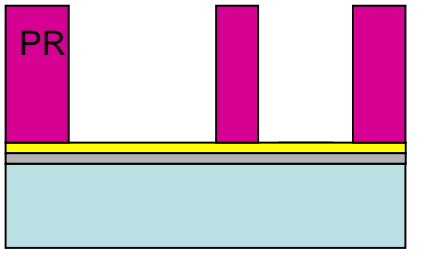
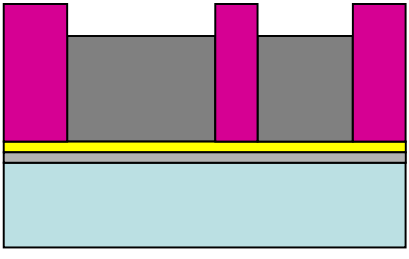
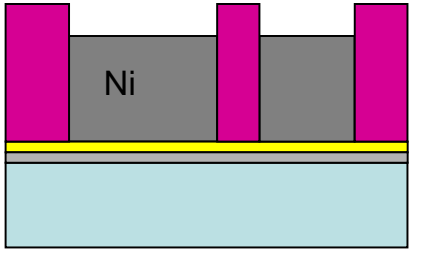
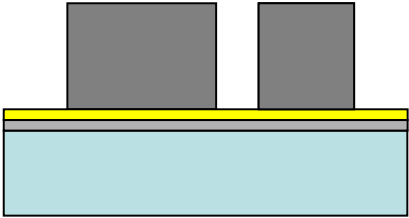
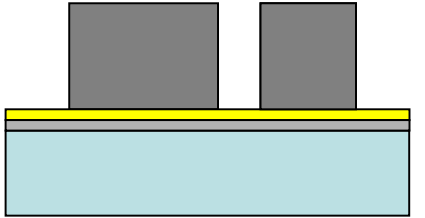
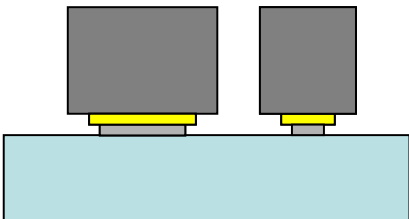
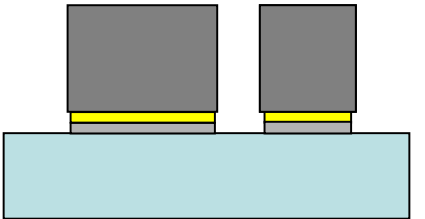
The completed removal of the Cr can be identified by visual observation. There should be no visible residue of Cr, which should be verified by inspections with optical microscope.

Example of process sequence

In the left column, a common process with usual undercut is depicted. In the right column, a process without significant undercut using the Cr-etch-210 solution is depicted.

After a patterned plating step, the seed layer of Cr/Au needs to be etched, in order to separate the plated features electrically. Using the Cr-etch-210, no significant undercut occurs.

Correspondingly, the sketch is valid for a process using photo resist for patterning.

<p>0. Au layer deposition (and adhesion layer of Cr)</p>		
<p>1. Photo resist pattern for electroplating</p> <p>2. Plasma treatment</p>		
<p>3. Electroplating (e.g. Ni)</p>		
<p>4. Resist removal</p>		
<p>5. Wet etch of Au seed (and adhesion layer removal)</p>		
	<p>Common etch process showing high undercut</p>	<p>Etch process using Cr-etch-200 showing least undercut</p> <p>(undercut of Au layer can be minimised using Au-etch-200)</p>

General application notes

Photo resist process

After development, photo resist masks should be processed with a hardbake step, e.g. 120°C (oven 30 minutes / hotplate 5 minutes). The hardbake strengthens the resist for the use in the etching solution. The rounded shapes of the resist, effected by the temperature treatment, normally do not impair the etching result.

Pretreatment

Substrates comprising photo resist should be pretreated in oxygen plasma, in order to remove any potential organic residues and to improve the wetting properties of the solution on resist masks. The surface is getting hydrophilic, no extra wetting agents are required.

Etching process

During the etching process, sufficient agitation of the solution or of the substrate is needed. If used in manual processing, the etching time required can be identified by observing a color changeover in the open etching areas and. After visual qualification the etching should be continued for 10% to 15% of the time elapsed, in order to assure the removal of any residues.

Post treatment

Thorough cleaning with DI-water / quick dump
Rinsing dryer or manually drying with nitrogen nozzle

Know issues / trouble shooting

Inhomogeneous etching result / incompleted etching

- Poor wetting / no descum or plasma executed
- Etching solution /etching capacity is consumed
- Not enough agitation

Poor resolution / high undercut

- Poor adhesion of resist
- Excessive etching time

Safety and disposal notes

This mixture is classified as hazardous substance according to international regulations. Refer to the safety and handling recommendations of the material safety datasheet before use.

Do not empty into drains or the aquatic environment. Collect used or unused solution in containers and perform waste disposal according to official state regulations. Cleaned containers may be recycled.

Technical Support

NB Technologies GmbH
Fahrenheitstr. 1, 28259 Bremen
Tel.: +49 421 2445810 FAX.: +49 421 22379787
Email: info@nb-technologies.de
Web: www.nb.technologies.eu