

Etching Solutions for Metal Precision Components

Advanced Chemical Etching Ltd.



ADVANCED CHEMICAL ETCHING LTD

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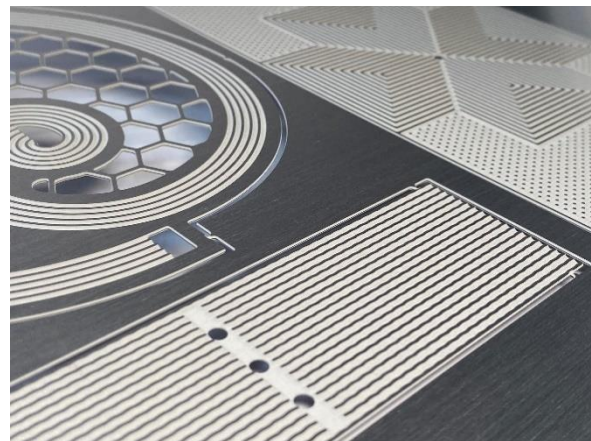
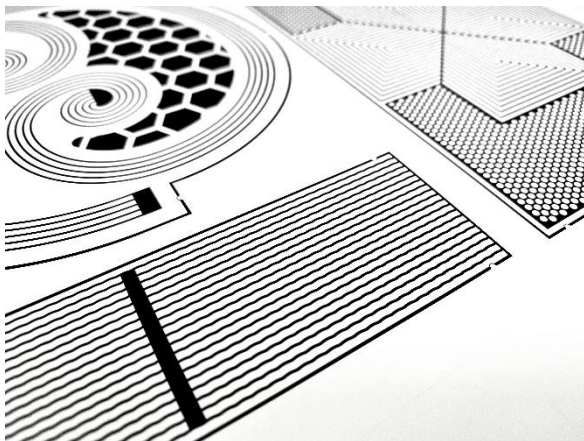
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What is Photochemical Etching?

Photochemical etching is a subtractive metal processing technique in which metal is removed selectively from a flat metal surface using a chemical reagent to create specific shapes or patterns.

The process uses CAD drawings transferred onto transparent photo-tools and used to create a negative image on a photosensitive polymeric film (photoresist) applied to the metal surface.

This process produces high resolution parts, often with complex geometries or with arrays of variable aperture profiles in relatively thin flat metal sheets from several tens of microns to ~2 mm in thickness. The process has a number of technical and economic advantages over other techniques such as traditional metal cutting and stamping.



What are some of the Challenges of Conventional Methods?

Some of the most valuable benefits of the photochemical etching process address challenges posed by conventional metalworking technologies. The most cost prevalent production methods used to manufacture precision metal components are stamping and laser cutting. These put very specific and considerable challenges to design engineers and production teams in three areas: prototyping to cost at tight schedules, the need for secondary processes to remove burr caused by production process and potential change to the metal properties due to thermal or physical stress on the material.

I. Rapid prototyping

- To create prototypes of metal precision parts, programming or tooling is needed for conventional methods. Design variants are therefore not only challenging for new product development projects in terms of time taken but also may be prohibitive due to high tooling costs for example as is the case with stamping.

II. Requirement of secondary processes

- With laser cutting and stamping sharp burrs are a commonplace unwanted quality issue. The burrs consist of very small but sharp material residue displaced but not removed completely in the production process. Burrs do not only pose dimensional issues, but may cause serious harm or malfunctions through contamination when not removed. This is the case even for the smallest burr. Costly secondary processes are used to remove burrs mechanically or electrochemically causing requiring additional budget and time.

III. Changed material properties

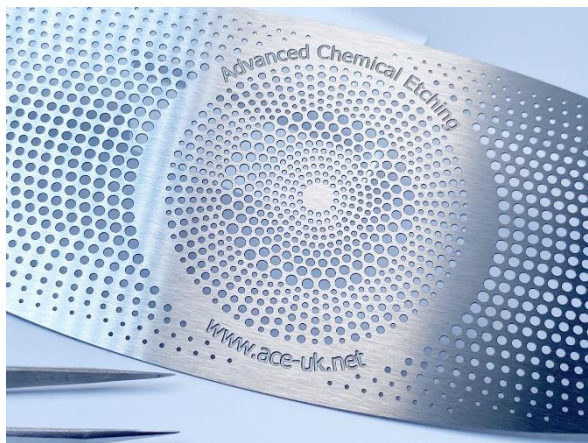
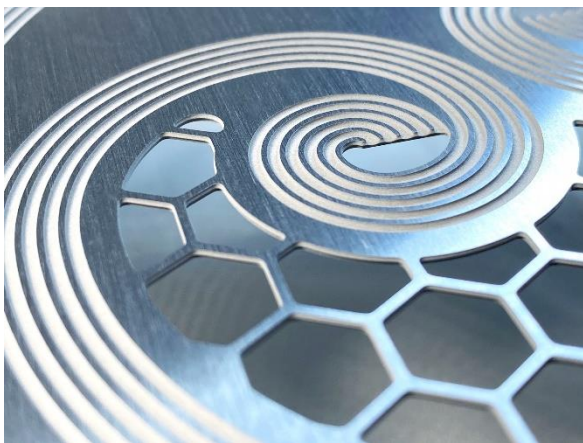
- Thermal Stress during laser cutting: part dimensions and material hardness and elasticity are only some of the key characteristic properties important when producing high precision metal components. The impact of high temperatures metal is subject to during laser cutting cannot be discounted as irrelevant. Precision components may be out of tolerance, even if only by micrometres; they may be subject to thermal deformations negatively impacting on flatness of the component or they may become brittle locally. These effects may be detrimental to the quality and functionality of the components and may be difficult to overcome in finished parts.
- Mechanical impact during stamping or hydroforming: mechanical impact on thin parts measuring micrometres in thickness may lead to local deformations and non-conformities, that may cause high precision components to fail. The average roughness of surfaces may be affected negatively during the production process with mechanical production processes and may therefore not be suited for a range of applications where smooth surfaces are required.

One viable alternative to conventional production methods may be photochemical etching as it neither uses heat nor mechanical impact to produce burr-free, flat, smooth high precision parts cost-effectively to tight tolerances and with short lead times.

What are the Benefits of Photochemical Etching?

Photochemical etching of metal parts makes use of chemical etchants to locally remove metal simultaneously across the whole sheet. Instead of thermal or mechanical impacts, the etchant is sprayed onto the metal thus overcoming limitations of contact production methods making it a viable and cost-effective alternative to conventional production technologies.

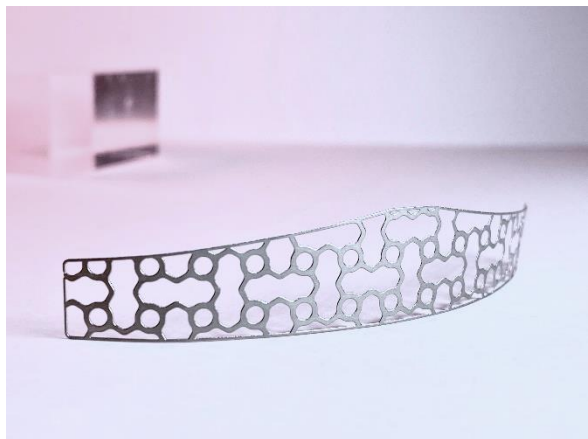
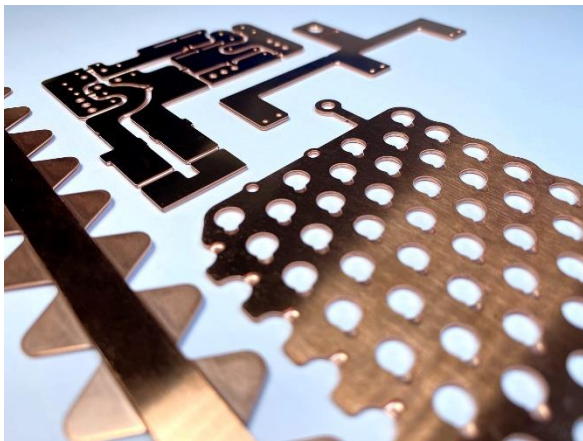
- Rapid prototyping of several design variants in parallel
- Low-cost tool solution at short lead-times
- Creates burr-free edges
- Results in stress-free components
- Achieves low average surface roughness
- Achieves tight tolerances
- Photochemical etching is suitable for most metals
- Offers unlimited complexity of geometries
- Achieves clean parts free from contamination



In which Industries is Photochemical Etching used?

The photochemical etching process offers a solution to common supply chain challenges such as cost and lead-time and removes the need for secondary operations like deburring, bore profiles and cleaning. This is beneficial for all industries, in which precision engineered flat or formed metal parts with material thicknesses between 5 microns to 2.5 mm are used. Examples are:

- F1 & Automotive
- Aerospace, Space, Defense
- Electronics
- Medtech
- Precision Engineering
- Renewable Energy



Who is Advanced Chemical Etching Ltd.?

Founded in 2000, Advanced Chemical Etching Ltd. are a specialist manufacturer of photochemically etched precision metal components. We are a dynamic team of experts with longstanding experience, who take pride in producing outstanding quality with our customers' requirements at the heart of every step of the way.

We are specialised in prototyping, pre-production and mid-size production runs. Providing solutions to our customers who seek to overcome challenges in their product development projects is at the core of our business.

Let's talk about your next project!

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