ADVANCED CHEMICAL ETCHING LTD

FUEL CELL PLATES

Advanced Chemical Etching (ACE) offer highly innovative and unique processes optimised to produce fuel cell plates in some of the most difficult alloys to etch. ACE plates are characterised by the highest precision, quality and positive impact on durability, light-weighting and miniaturisation objectives.

Bipolar PEM fuel cell plates are metal plates featuring complex channel geometries creating flow paths. These channels are designed to offer a large surface area for adequate hydrogen or liquid flow whilst at the same time maintaining a sufficient contact surface area between the bipolar plate and the adjacent electrodes.

CAPABILITY

ACE manufactures photochemically etched PEM fuel cell plates to match our customers' exacting requirements in a wide variety of metals to suit the application. ***Photochemical etching of metal plates provides an effective way of producing depth etched channels and apertures without affecting the chemical or physical properties of the base metal***. The chemical etching process achieves ***burr free plates***, that are ***free from thermal stress ensuring effectiveness of downstream processes***. And complexity of the flow path does not affect cost.

Fuel cell plates can be etched in material thicknesses from 0.25mm to 2mm and in dimensions of up to 600 x 1500mm depending on the material. Channel depths are typically etched to up to 50% of the material thickness with a 2:1 channel width to depth ratio. ***Unlimited freedom is afforded to design engineers pertaining to the geometries of the flow channel design options***.

Both sides of the metal plate can be etched simultaneously with offset channels supporting cost and weight optimisation goals. Through the use of photochemical etching, ***channels can be created for miniaturised and extreme lightweight bipolar plates which may be deployed in portable devices***, ***aircraft and drones*** amongst many other applications. ***ACE also offer brazing foils*** and additional services including ***diffusion bonding and vacuum brazing*** via approved subcontractors.

Contact ACE today on +44 (0)1952 416 666 to find out what we could produce for you – whether it's 1s or millions.

TYPICAL ETCHED COMPONENTS

- Brazing foils
- Two-sided plates with offset channels
- Bipolar plates

METALS

- Titanium (all alloys)
- Stainless Steel (all grades)
- High-Temperature Nickel Alloys
- Aluminium

TECHNICAL CAPABILITY

All measures are stated in millimeters. Further dimensions and tolerances may be achieved as R&D projects.

METAL THICKNESS	MIN CHANNEL WIDTH	CHANNEL TOL (±)	MIN RIDGE	RIDGE TOL (±)	CHANNEL DEPTH	CHANNEL DEPTH TOL (±)
0.25mm	0.30mm	0.038mm	0.20mm	0.038mm	0.15mm	0.025mm
0.30mm	0.36mm	0.045mm	0.24mm	0.045mm	0.18mm	0.030mm
0.35mm	0.42mm	0.053mm	0.28mm	0.053mm	0.21mm	0.035mm
0.40mm	0.48mm	0.060mm	0.32mm	0.060mm	0.24mm	0.040mm
0.45mm	0.54mm	0.068mm	0.36mm	0.068mm	0.27mm	0.045mm
0.50mm	0.60mm	0.075mm	0.40mm	0.075mm	0.30mm	0.050mm
0.60mm	0.72mm	0.090mm	0.48mm	0.090mm	0.36mm	0.060mm
0.70mm	0.84mm	0.105mm	0.56mm	0.105mm	0.42mm	0.070mm
0.80mm	0.96mm	0.120mm	0.64mm	0.120mm	0.48mm	0.080mm
0.90mm	1.08mm	0.135mm	0.72mm	0.135mm	0.54mm	0.090mm
1.00mm	1.20mm	0.150mm	0.80mm	0.150mm	0.60mm	0.100mm
1.20mm	1.44mm	0.180mm	0.96mm	0.180mm	0.72mm	0.120mm
1.50mm	1.80mm	0.225mm	1.20mm	0.225mm	0.90mm	0.150mm

PROFILE TOL (±)	INTERNAL RADS	EXTERNAL RADS	ETCH CUSP
0.038mm	0.28mm	0.20mm	0.06mm
0.045mm	0.33mm	0.24mm	0.08mm
0.053mm	0.39mm	0.28mm	0.09mm
0.060mm	0.44mm	0.32mm	0.10mm
0.068mm	0.50mm	0.36mm	0.11mm
0.075mm	0.55mm	0.40mm	0.13mm
0.090mm	0.66mm	0.48mm	0.15mm
0.105mm	0.77mm	0.56mm	0.18mm
0.120mm	0.88mm	0.64mm	0.20mm
0.135mm	0.99mm	0.72mm	0.23mm
0.150mm	1.10mm	0.80mm	0.25mm
0.180mm	1.32mm	0.96mm	0.30mm
0.225mm	1.65mm	1.20mm	0.38mm

BENEFITS OF THE ETCHING PROCESS

BURR AND STRESS-FREE
No mechanical or thermal stress on the plate that could compromise its flatness

DESIGN FLEXIBILITY
Sheet sizes up to 600mm x 1500mm

PRECISION CHANNELS
Economically produced on both sides of the plate to create optimal cooling performance

SURFACE FINISH
A non-directional surface finish within the etched flow channels for optimum laminar flow

LOW SET-UP COSTS
The tooling for etching is digital, low cost and can be modified quickly

SHORT LEAD TIMES
Complex geometries manufactured in high volumes within weeks

Contact our expert team today to find out what we coud produce for you – whether it's 1s or millions.

CONTACT THE TEAM ON **+44(0)1952 416 666 | info@ace-uk.net | www.ace-uk.net**