

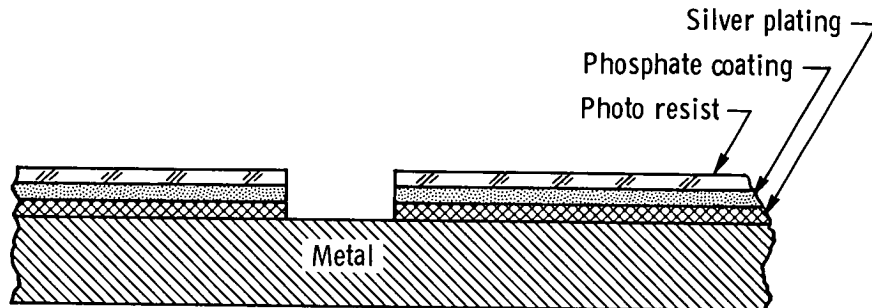
NASA TECH BRIEF

Lewis Research Center



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IMPROVED PHOTOETCHING FABRICATION METHOD



An improved photoetching fabrication method has been devised which produces sharp, well-defined lines with minimum undercutting when deep etching with ferric chloride. This method was developed for etching coolant passages into nickel sheet during fabrication of rocket thrust chambers; it can be used advantageously in other applications.

A phosphate coating is applied over the conventional silver plate maskant and a phosphoric acid solution, rather than the conventional nitric acid, is used to remove the silver maskant. The thin porous phosphate coating provides better adhesion of the photoresist material to the silver plating and prevents excessive etching of the edges of the silver plate. The use of phosphoric acid is also instrumental in preventing etching of the silver edges. The resulting mask has accurate sharply-defined lines and undercutting is substantially reduced. An additional advantage is that the phosphoric acid does not etch the base metal, as does nitric acid, which facilitates replacing or realigning the mask if necessary.

To use this method, the surface of the part to be etched is first electroplated with silver to a thickness of 0.0127 to 0.0381 mm (0.0005 to 0.0015 inch). The phosphate coating is then applied over the silver by immersion in a 15 to 20 percent solution of phosphoric acid. The part is made anodic and a cathode of nickel is used. Current is applied at 1-5 volts dc for 5 to 10 seconds or until the plating turns a dull off-white color. This short duration produces the phosphate coating; if the process were continued, deplating of the silver would begin. The plated part is rinsed, cleaned in a 10 to 15 percent solution of hydrochloric acid for 5 minutes, rinsed again, and baked at 355 to 366 K (180 to 200°F) for an hour.

When the part is cool, a conventional photoresist material is applied, exposed, developed and stripped from the areas to be etched, in a conventional manner. The phosphate coating and silver plate are removed from the exposed areas by deplating in a 20 to 30 percent solution of phosphoric acid. The part is again made anodic and a cathode of nickel is used. A current at 9-10 volts dc is applied until the plating is removed.

NOTE:

No additional documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer
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Reference: B72-10745

PATENT STATUS:

Inquiries concerning rights for the commercial use of this invention should be addressed to:

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