

Fluorides in chromium baths are:

either added to fluoride free chromium baths to make the bath more aggressive when using difficult to activate steels and polarity reversal or when using self-regulating chromium baths, which are used for hard chromium and decorative chromium.

To baths of the first group is added sodium fluoride in concentrations up to 600 mg/liter. In the second group the free fluoride content varies according to the bath composition and the use of buffering agents and can rise up to 2 g fluorides /liter. It has been found that up to 30 mg/l platinised titanium with 2,5 microns platinum can be operated for quite a long time, for 5 microns with 90 mg/l up to nearly one year.

The fluoride attack depends on the concentration of the free fluoride ions, the temperature and the current density. It is recommended that potential users first investigate whether they can use platinised titanium at fluoride concentrations up to 100 mg/liter or whether they have to use platinised niobium, which is resistant to fluoride concentrations up to 600 mg/l. In the presence of even higher fluoride concentrations platinised tungsten may be used.

Users can normally only tell the total fluoride content but not the content of free fluoride ions. Therefore this item has to be clarified either with the bath supplier or directly by using uncoated titanium, niobium etc. samples and polarizing them in this very bath anodically. Attack happens if one gets no passivation.

Fluorides are also added to some black chromium baths. Also to trivalent chromium baths, which work with mixed oxide coated titanium anodes of the type iridium/tantalum oxide, fluorides are added in concentrations of 50 mg/liter or slightly more. All parts immersed in the bath and a portion above it have to be coated with 18 g iridium/m<sup>2</sup>. If it can be avoided that the coating gets scratched during installation, operation these anodes work perfectly in the presence of small fluoride concentrations.

Practical experiences:

- Platinised niobium anodes in chromium baths with up to 600 mg/liter free fluoride ions are operated at current densities of 20 A/dm<sup>2</sup> with life times of 2 and more years, whereas with titanium as base metal the anode fails within 3 weeks.
- Platinised titanium anodes with a 5 microns coating failed after 11 months at the presence of 90 mg fluoride ions/liter.
- Mixed oxide coated titanium anodes with Ir/Ta oxides of 18 g Ir/m<sup>2</sup> were used for years in a trivalent chromium bath with 70 mg free fluorides per liter.

Platinised titanium anodes can only be used at low fluoride concentrations of the order of 10 mg/liter. For free fluoride concentrations up to 600 mg/liter niobium is an alternative, and for slightly higher fluoride concentrations also tungsten. In all cases the applicant is advised to test the usability of the given anodes under actual plating conditions.

#### Gold and platinum group metal chemistry

- Salts, compounds and solutions
- Gold and PGM electroplating baths
- PGM coated parts

#### Insoluble Anodes

- Titanium and niobium parts
- Customized anodes
- Special base metals and activations

#### Shaped Material

- Platinum and platinum/rhodium alloys

Passed to you by:

## METAKEM

Precious metal technology  
METAKEM GmbH  
Achtzehnmorgenweg 3  
D-61250 Usingen(Germany)  
Telefon 0 60 81 / 10 60-0  
Fax 0 60 81 / 10 60-60  
e-mail [info@metakem.de](mailto:info@metakem.de)  
Internet [www.metakem.de](http://www.metakem.de)