Etching of printed circuit boards with Sodium Peroxodisulfate

Peroxodisulfates are widely used for different etching steps in the manufacturing of printed circuit boards due to their very high redox potential. With peroxodisulfates surfaces can be cleaned or copper can be removed by an oxidative process.

Sodium peroxodisulfate is mainly used for etching of printed circuit boards. Potassium peroxodisulfate can be used but the solubility is much lower. Ammonium peroxodisulfate is not used due to the problems caused by the ammonium ion.

Sodium peroxodisulfate is applied e.g. in the following etching steps:

- Etching of the printed circuit board to prepare it for the chemical or electrochemical platting with copper
- Removal of copper after screen or photo printing
- Removal of copper after removal of the photo resist if gold, nickel/gold, silver/gold or rhodium was used as the resist

Copper is removed by the etching process as follows:

$$Na_2S_2O_8 + Cu \rightarrow CuSO_4 + Na_2SO_4 + \text{energy}$$

The heat from the dissolution of copper must be removed to avoid local Hot Spots.

Typically an etching solution contains:

- 1000 ml water
- about 250 g sodium peroxodisulfate
- 1 ml $HgCl_2$-catalyst solution(about. 5 mg Hg)

Etching process should be carried out in the temperature range of ca. 40 to 45 °C. About 40 g/l of copper can be dissolved in the etching solution, and approx. 6 kg of sodium peroxodisulfate are needed to dissolve 1 kg of copper.

The copper and sodium peroxodisulfate content in the etching solution can be determined by the usual analytical methods.

Waste water treatment

For the waste water treatment, the spent etching solution should be made alkaline (to a pH value of about 11). The residual sodium peroxodisulfate decomposes which generates oxygen, and the copper is precipitated as various copper hydroxides. In principle the copper may also be removed by an electrochemical process.

Without a suitable waste water treatment the spent etching solution must not be stored in sealed containers without suitable pressure relief, due to the formation of oxygen from the residual sodium peroxodisulfate as it decomposes

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