

RAMSIGNAL CHARACTERISTICS OF CURRENT
SIGNALS (CH) SOA ETCHING IN
ALUMINUM ETCHING

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**PHYSICAL CHARACTERISTIC OF COPPER(II) SULPHATE (Cu(II) SO₄)
ETCHANT ON ALUMINIUM ETCHING**

By
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DECLARATION

I hereby declare that this thesis entitled Physical Characteristic of Copper(II) Sulphate (Cu(II) SO₄) Etchant on Aluminium Etching is the result of my own research except as cited in the references.

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PHYSICAL CHARACTERISTIC OF COPPER(II) SULPHATE (Cu(II) SO₄) ETCHANT ON ALUMINIUM ETCHING

ABSTRACT

Chemical etching is a process applies a strong chemical solution, called etchant to the surface of a workpiece to gradually remove any unwanted workpiece material. Basically, it is corrosion controlled process and is an irreversible chemical reaction. It is widely used as a nontraditional machining process to produce a geometrically complex and dimensional accurate component. Chemical etching is a useful process to reduce the excess mass of a workpiece material. In this study, Aluminium (Al) was etched in a solution of Copper(II) Sulphate (Cu(II) SO₄) and Sodium Chloride (NaCl) where Cu(II) SO₄ act as the limiting reactant or etchant for the electrochemical reaction to occur. The beneficial using this etchant is that there is no production of harmful gases compared to etching with mineral acids such as nitric and hydrochloride acid. The chemical etching of Al was carried out using single side immersion etching method where the Al samples were purposely mounted in epoxy resin with an exposed area of 4 cm² for efficient grinding and polishing. The experimental study of the chemical etching of Al was conducted at different etching temperature and also at different concentration of the etchant. The parameter on the selected chemical etching effects on the depth of etch, weight loss, and also the surface finish quality of the Al were investigated. As a result, It was observed that Cu(II) SO₄ has a fast etch rate and was a useful etchant for Al. When the etching temperature and the etchant concentration increase, the Al etches rate increase, tend to have a greater depth of etch and weight loss which also results in a better surface quality.

SIFAT-SIFAT FIZIKAL PENGORES KUPRUM (II) SULFAT (Cu(II) SO₄) TERHADAP GORESAN ALUMINIUM

ABSTRAK

Goresan kimia ialah satu proses menggunakan solusi kimia yang kuat, dipanggil pengores pada permukaan sesuatu benda untuk mengeluarkan apa-apa bahan yang tidak teringin secara beransur-ansur. Pada dasarnya, ia ialah proses pengawalan goresan dan juga satu tindak balas kimia yang tidak songsang. Ia digunakan secara meluas sebagai satu pemprosesan yang tidak tradisional untuk menghasilkan komponen yang bergeometri kompleks dan berdimensi tepat. Goresan kimia ialah satu proses yang berguna untuk mengurangkan jisim yang berlebihan pada sesuatu bahan. Dalam kajian ini, Aluminium (Al) digores dalam satu solusi yang mengandungi Kuprum (II) Sulfat (Cu(II) SO₄) dan Natrium Klorida (NaCl) dimana Cu(II) SO₄ bertindak sebagai pengehad reaktan atau pengores supaya tindak balas elektrokimia berlaku. Faedah menggunakan pengores ini adalah kerana ia tidak membebaskan wap-wap yang berbahaya berbanding dengan goresan yang menggunakan mineral asid seperti asid nitrik dan asid hidroklorik. Goresan kimia pada Al dijalankan dengan menggunakan kaedah pencelupan satu sisi dimana Al sampel dengan sengajanya dicantumkan pada damar epoksi dengan pendedahan kawasan sebanyak 4 sm² demi kecekapan pengasahan dan pengilapan. Pengajian percubaan untuk goresan kimia pada Al dijalankan pada suhu goresan dan kepekatan pengores yang berbeza. Aspek yang terpilih untuk mengaji kesan goresan kimia pada Al seperti kedalaman goresan, kehilangan berat, dan juga sifat permukaan setelah selesai pengoresan telah diambil. Pada akhirnya, adalah didapati bahawa Cu(II) SO₄ mempunyai kadar goresan yang cepat dan adalah pengores yang berguna untuk Al. Apabila suhu goresan dan kepekatan pengores meningkat, kadar goresan Al meningkat, secara tidak langsung mempunyai kedalaman goresan dan kehilangan berat yang lebih serta mengakibatkan sifat permukaan yang lebih baik.