

## Anodal<sup>®</sup> EC-1 Liquid

Silicate- and chlorate-free liquid sequestrant for the preparation of E-6 etching baths for aluminium and its alloys

### Anodal EC-1 Liquid

- is applied as an addition to caustic soda for satin and matt finishes on aluminium parts by the immersion method before anodizing. With an aluminium content of 100-150 g/l this treatment imparts a uniform, matt, decorative appearance to the aluminium parts. Minor surface imperfections are usually completely or almost completely covered.
- as an addition to caustic soda prevents the formation and deposition of aluminate on the walls of the vessels and heating coils.

For uniformly etched surfaces, precleaning with a degreasing product (e.g. **Anodal DA-5 Powder**) is necessary.

The following very good properties are worthy of mention:

- very good E6 effect
- good levelling with little erosion
- low application concentration: 20-50 g/l
- low viscosity
- titratable
- very good degradability
- premixing with caustic soda is possible.

## 1. Properties

Appearance	clear, aqueous solution
Chemical character	organic sequestrant in aqueous solution
Density	approx. 1140 kg/m <sup>3</sup>
Viscosity	approx. 13 mPa.s at 20°C, determined on a Brookfield Viscometer RVT, 50 rpm, spindle 1
Dilutability	dilutable with water in any proportion
pH of the commercial product	10 - 11
Storage stability	at least 3 years in the original container
Ecotoxicological data	see Safety Data Sheet.

## 2. Application

Process	immersion or spray process
Applicable amount	20-50 g/l <b>Anodal EC-1 Liquid</b> depending on the Al content of the bath 50-80 g/l sodium hydroxide (caustic soda solid)
Temperature	50-60°C
Treatment time	5-20 min according to the surface condition and desired degree of mattness. Very often a treatment time of 5-10 min is chosen.

After etching rinse immediately with running water. It is advantageous to neutralize with oxidizing acids (nitric acid or sulphuric acid with an addition of hydrogen peroxide).

## 3. Monitoring the bath

For uniform etching it is necessary to maintain the sodium hydroxide concentration in the bath at the desired concentration. For optimum long-term etching the Al content should be between 100-150 g/l.

In order to achieve the same effect the concentration of free sodium hydroxide should be increased to 80 g/l and the concentration of **Anodal EC-1 Liquid** to 50 g/l as the aluminium content increases.

When strengthening with sodium hydroxide we recommend adding 0.2-0.3 kg **Anodal EC-1 Liquid** to 1 kg sodium hydroxide.

#### 4. Analysis of the bath

##### 4.1 Free sodium hydroxide and aluminium content

###### **Reagents**

2N hydrochloric acid

phenolphthalein; 1% solution in ethanol

sodium fluoride

###### **Equipment**

magnetic stirrer

500 cm<sup>3</sup> Erlenmeyer flask

250 cm<sup>3</sup> volumetric flask

25 and 50 cm<sup>3</sup> transfer pipettes

50 cm<sup>3</sup> burette

###### **Titration**

Dilute 25 cm<sup>3</sup> previously filtered etching bath to 250 cm<sup>3</sup> with demineralized water in a volumetric flask.

In an Erlenmeyer flask, add 200 cm<sup>3</sup> demineralized water to 50 cm<sup>3</sup> of this solution and a drop of phenolphthalein solution.

This solution is titrated with 2N hydrochloric acid until colourless.

Acid consumption, first titration:            **a** cm<sup>3</sup>

Add 10 g sodium fluoride to the titrated solution and stir for 2 min. Then titrate again with 2N hydrochloric acid until colourless. The colourless solution is then stirred for another 1 min. Any red colouration which occurs is titrated again until colourless.

Acid consumption, second titration:        **b** cm<sup>3</sup>

###### **Calculation**

g/l aluminium                                = ( 0.008 **b** + 3.68 ) **b**

g/l free sodium hydroxide                = 16.1 **a** - ( 0.012 **b** + 5.5 ) **b**

g/l total alkali                                = 16 **a**

## 4.2 Anodal EC-1 Liquid content

### **Reagents**

0.2N potassium permanganate solution

0.2N oxalic acid solution

acid mixture:  $950 \text{ cm}^3$  sulphuric acid 96%  
 $50 \text{ cm}^3$  phosphoric acid 85%  

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 $1000 \text{ cm}^3$  acid mixture

### **Equipment**

magnetic stirrer with heating plate

$500 \text{ cm}^3$  Erlenmeyer flask

$250 \text{ cm}^3$  volumetric flask

$20 \text{ cm}^3$ ,  $25 \text{ cm}^3$  and  $50 \text{ cm}^3$  transfer pipettes

$50 \text{ cm}^3$  burette.

### **Titration**

Dilute in a volumetric flask  $25 \text{ cm}^3$  filtered etching bath to  $250 \text{ cm}^3$  with demineralized water.

In an Erlenmeyer flask add  $100 \text{ cm}^3$  demineralized water to  $20 \text{ cm}^3$  of this solution and  $50 \text{ cm}^3$  0.2N potassium permanganate solution, warm up to  $70^\circ\text{C}$  and then stir for 5 min.

After cooling down to  $40^\circ\text{C}$ , add  $20 \text{ cm}^3$  acid mixture carefully while stirring. Warm up to  $70^\circ\text{C}$  again and add  $50 \text{ cm}^3$  0.2N oxalic acid.

After decolouration the warm solution is immediately titrated with 0.2N potassium permanganate to a permanent pink colour.

Consumption 0.2N potassium permanganate:  $c \text{ cm}^3$

### **Calculation**

**g/l Anodal EC-1 Liquid = 1.74 c**

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The information and recommendations presented here were compiled with the utmost care, but cannot be extended to cover every possible case. They are intended to serve as non-binding guidelines and must be adapted to the prevailing conditions.