

Anodal[®] EC-2 Liquid

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

Anodal EC-2 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
- very good results even with Zn-containing alloys
- low application concentration: 20-50 g/l
- Al content over 150 g/l also possible
- 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. 1170 kg/m ³
Viscosity	approx. 17 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 Anodal EC-2 Liquid 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-2 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-2 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 cm³ Erlenmeyer flask

250 cm³ volumetric flask

25 and 50 cm³ transfer pipettes

50 cm³ burette

Titration

Dilute 25 cm³ previously filtered etching bath to 250 cm³ with demineralized water in a volumetric flask.

In an Erlenmeyer flask, add 200 cm³ demineralized water to 50 cm³ of this solution and a drop of phenolphthalein solution.

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

Acid consumption, first titration: **a** cm³

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** cm³

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-2 Liquid content

Reagents

0.2N potassium permanganate solution

0.2N oxalic acid solution

acid mixture: 950 cm^3 sulphuric acid 96%
 50 cm^3 phosphoric acid 85%
 1000 cm^3 acid mixture

Equipment

magnetic stirrer with heating plate

500 cm^3 Erlenmeyer flask

250 cm^3 volumetric flask

20 cm^3 , 25 cm^3 and 50 cm^3 transfer pipettes

50 cm^3 burette.

Titration

Dilute in a volumetric flask 25 cm^3 filtered etching bath to 250 cm^3 with demineralized water.

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

After cooling down to 40°C , add 20 cm^3 acid mixture carefully while stirring. Warm up to 70°C again and add 50 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-2 Liquid = 2.6 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.