

SurTec® 404

E6-Etching Additive

Properties

- alkaline liquid
- produces an uniform etching finish on surfaces of aluminium alloys even from start-up of the bath operation
- only very low foam formation even at high throughput
- free of nitrate, nitrite, chlorate and chloride
- good wetting and dispersing properties
- no formation of aluminium stone in case of high aluminium concentration

Application

make-up values:

SurTec 404	35 g/l
NaOH	50 g/l

analytical values:

aluminium	120-250 g/l
SurTec 404	30 - 45 g/l
NaOH	75 - 80 g/l

make-up: Work in aluminium until an amount of 30-45 g/l aluminium is dissolved in the etching bath.

temperature: 50-60°C

application time: 10-20 min

agitation: essential: circulation of the bath by compressed air

tank material: heatable steel tanks (alloy ST 35), stainless steel tanks

heating: required, made of alkaline resistant material

exhaust: required for worker's protection

hint: Additional cooling will be necessary if you are operating at full capacity (workpiece flow). That can be done with steel radiators filled with cold water. This water can also be used for the rinsing baths. For best E6 finish results the temperature has to be kept constant.

Technical Specification

(at 20°C)	Appearance	Density (g/ml)	pH-value (conc.)
SurTec 404	liquid, yellowish-orange, clear to slightly turbid	1.239 (1.23-1.26)	approx. 9.5

Maintenance and Analysis

Bath solution is permanently carried off by drag-out and the active substances are consumed by the etching process. Therefore analyse the concentration of sodium hydroxide, aluminium and SurTec 404 regularly by titration. If necessary replenish the bath with SurTec 404 and sodium hydroxide according to the aluminium content.

Sample Preparation

Take a sample at a homogeneously mixed position. Let it cool down to room temperature. If the sample is turbid, let the turbidity settle down and decant or filter the solution by using a blue ribbon filter. The sample must be clear and free of suspended particles.

Sodium Hydroxide (NaOH) und Aluminium – Analysis by Titration

reagents:	1 mol/l hydrochloric acid (= 1 N HCl solution) potassium fluoride solution (KF solution, 35 %) indicator: phenolphthalein solution (0.1 % in 70 % ethanol)
procedure:	<ol style="list-style-type: none">1. Pipette 5 ml bath sample into a 300 ml Erlenmeyer flask.2. Dilute with 100 ml deionised water and mix well.3. Add 3-4 drops of indicator solution (the colour of the solution turns from colourless to pink).4. Titrate with 1 mol/l hydrochloric acid to discolouration (white). = consumption A (ml)5. Add 70 ml KF solution (colour changes to pink again).6. Refill the burette with 1 mol/l hydrochloric acid up to zero.7. Titrate again from pink to discolouration. = consumption B (ml)8. For control add 5 ml potassium fluoride solution: if the solution remains colourless the titration is finished, if the colour changes to pink please keep on titrating to complete discolouration.
calculation:	$(\text{consumption A in ml} - 1/3 \text{ consumption B in ml}) \cdot 8 = \text{g/l NaOH}$ $\text{consumption B in ml} \cdot 2 = \text{g/l aluminium}$

SurTec 404 – Analysis by Titration

reagents:	0.1 mol/l sodium thiosulfate solution (= 0.1 N Na ₂ S ₂ O ₃ solution) 1 mol/l hydrochloric acid (= 1 N HCl solution) hydrochloric acid solution (10 %) indicator: phenolphthalein solution potassium fluoride solution (35 %): dissolve 350 g potassium fluoride (KF) in water, fill up to 1000 ml and neutralize with phenolphthalein indicator solution potassium iodide solution (10 %): dissolve 10 g potassium iodide (KI) in 100 ml of deionised water sodium periodate solution: dissolve 4.4 g sodium periodate (NaIO ₄) in 200 ml 0.05 mol/l (1 N) sulfuric acid and fill up with deionised water to 1000 ml starch solution: add 2 g starch to 100 ml water and boil 10 minutes
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procedure:

1. Pipette 10 ml bath sample into a 100 ml volumetric flask.
2. Fill up with deionised water and mix the solution thoroughly.
3. Transfer 5 ml of this dilution into a 300 ml flat-bottomed flask with grounded glass stopper.
4. Add 50 ml deionised water.
5. Add some drops of indicator solution.
6. Add 15 ml potassium fluoride solution.
7. Neutralise the solution with 1 mol/l hydrochloric acid from pink to colourless.
8. Add 20 ml sodium periodate solution and close the flask.
9. Let the solution react 15 minutes in the dark.
10. Then add 20 ml potassium iodide solution.
11. Acidify with 50 ml 10 % hydrochloric acid solution.
12. Titrate the brown coloured solution with 0.1 mol/l sodium thiosulfate to light yellow.
13. Add some drops of starch solution (colour change to dark blue).
14. Continue titrating with 0.1 mol/l thiosulfate solution to colourless.
= consumption bath sample (ml)
15. The stability of the used chemicals is limited. Therefore check activity and efficiency of the chemicals with the same procedure as described above. Instead of the bath sample add 55 ml water.
= blank value (ml)

calculation:

$$\begin{aligned} & (\text{blank value in ml} - \text{consumption bath sample in ml}) \cdot 15.2 \\ & = \text{g/l SurTec 404} \end{aligned}$$

Ingredients

- complexing agents
- alkali hydroxide
- reducing agent

Stock Keeping

The consumption depends heavily on the drag-out. To determine the exact amounts of drag-out, see [SurTec Technical Letter 11](#).

The following value per m² can be taken as estimated average consumption:

SurTec 404 approx. 20 g

In order to prevent delays in the production process, per 1000 l bath the following amount should be kept in stock:

SurTec 404 50 kg

Product Safety and Ecology

The safety instructions and the instructions for environmental protection have to be followed in order to avoid hazards for people and environment. The Material Safety Data Sheets (according to European legislation) contain explicit details for this.

The following hazard designations and classifications into water hazard classes (WHC) have to be taken into account:

<u>product</u>	<u>hazard designation</u>	<u>water hazard class</u>
SurTec 404	-	WHC 1

Warranty

We are responsible for our products in the context of the valid legal regulations. The warranty exclusively accesses for the delivered state of a product. Warranties and claims for damages after the subsequent treatment of our products do not exist. For details please consider our [general terms and conditions](#).

Further Information and Contact

In our forum, you can discuss topics of the surface technology:

<http://forum.SurTec.com/>

If you have any questions concerning the process, please contact your local technical department: <http://SurTec.com/International.html>

25 October 2011/DK, WT