Henkel Technologies

TECHNICAL BULLETIN

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ALUMINUX LL

Aluminux LL has the following advantages over conventional etchant systems:

- **Greatly extended bath life**
- **Reduced down time**
- **Increased plant utilisation**
- **Consistent etch quality**
- **Single liquid product – no additives**
- **Simple control method**
- **No heavy scale deposits**
- **Wide range of operating temperatures**
- **Less metal removal to achieve good finish**
- **No chromates or fluorides**
- **Effluent disposal reduced**
- **No sludge formation if solution cooled**
- **Overall cost efficiency to customer**

Aluminux LL

1. INTRODUCTION

Aluminux LL is a liquid caustic etchant for aluminium, which permits the continued use of the etch solution without the need for periodical dumping.

The 'spangling' effect sometimes encountered on work after continued use of a conventional etch bath, does not occur with **Aluminux LL**.

Aluminux LL produces a satin etch equivalent to the best obtained with conventional caustic etch solutions and this etch is obtained consistently through the whole long life of the bath. This finish is achieved with less metal removal than conventional etchants, resulting in more efficient use of the etchant.

During operation of an **Aluminux LL** long life etch solution, the aluminate concentration will increase up to approximately 400 grams per litre, when an equilibrium point is reached. At the equilibrium point, sodium aluminate will be carried out of the bath as 'drag-out' at the same rate as it is formed by dissolved aluminium. At this stage adequate post-etch rinsing is essential.

As the aluminate content increases towards the equilibrium condition, it is necessary to increase the free causticity of the etch solution to maintain the etch rate and the bath stability. Full information on operating procedures for **Aluminux LL** are given below.

To simplify the operation of a long life etching system, **Aluminux LL** has been formulated as a single liquid product. Stock control is made simpler by having only one product, which may be stored in bulk tanks and piped direct to the etch tank. This type of installation not only gives cost savings due to bulk handling and delivery, but is a lot safer for personnel who are at no time required to handle the concentrated material.

2. OPERATING INSTRUCTIONS

The successful running of a long life etch solution will vary from operation to operation depending on workload, size of tank, type of alloy, conditions of extrusions and etch finish required. Our representatives will be pleased to advise on optimum conditions for specific operations.

In most operations where **Aluminux LL** is used as a direct replacement for other caustic etchants, the initial charge will be at the same rate as previously – about 5% v/v of **Aluminux LL**.

It is usual for an **Aluminux LL** etch bath to be operated at 60°C – 65°C. Etch times will vary from 4 to 15 minutes, depending on surface etch required.

It should be noted that the initial etch rate (metal removal rate) will be lower than for the equivalent concentration of a conventional caustic etchant. In most cases, however, the finish will be equivalent, or superior and etch rate may be disregarded.

3. BATH MAINTENANCE

During the initial operation, whilst the sodium aluminate content increases to approximately 100 grams/litre, the initial concentration of **Aluminux LL** should be maintained.

During the further build-up to bath equilibrium, the concentration of **Aluminux LL** must be increased to maintain the desired etch characteristics and bath stability. Between 100-300 grams per litre sodium aluminate, the concentration of **Aluminux LL** is increased progressively from 5% v/v to 11% v/v. At 400 grams per litre, which is effectively the maximum sodium aluminate concentration reached, the concentration of **Aluminux LL** should be maintained at 11 – 13 % v/v.

As the equilibrium point is reached, the rate of increase in sodium aluminate content will fall off, until it reached a maximum for the particular operation. This will usually be from 300 – 400 grams per litre, and the time taken from 4 – 12 weeks. Following equilibration, the
Aluminux LL concentration is held at the appropriate level to maintain the required etch finish.

4. BATH CONTROL

Control of an **Aluminux LL** etch solution is based on determination of the concentrations of etchant and sodium aluminate, using a pair of acidimetric titrations.

Analysis

a) Pipette a 10 ml sample of the etch solution into a flask

b) Add 100 ml distilled water.

c) Add 15 ml of 20% sodium gluconate solution and 5 ml of 10% barium chloride solution.

d) Add a few drops of phenolphthalein indicator and titrate with 1 N sulphuric acid
to a colourless end point.

The number of mls added = **Titration A**

When this end point is reached.

a) add 10 ml of 10% potassium fluoride solution (pink colour returns)
b) add further 10 ml portions of potassium fluoride and titrate again until no pink colour re-appears.

The total mls of 1 N sulphuric acid used after the first addition of potassium fluoride is **Titration B**.

Concentration of **Aluminux LL** = 0.58 x (A-B/3)% v/v.

Concentration of sodium aluminate = 2.72 x B grams per litre.

Analysis (continued)

As the sodium aluminate content increases, the sample volume should be reduced so that for over 200 grams per litre of aluminate, a 2 ml sample is used. The volumes of sodium gluconate, barium chloride and potassium fluoride should remain the same.

Recommended sample sizes are:

0 – 100 grams per litre aluminate – take 10 ml sample.
100 – 200 grams per litre aluminate – take 5 ml sample and multiply titration figures by 2.
200 – 500 grams per litre aluminate – take 2 ml sample and multiply titration figures by 5.

Additions for Aluminux LL

Aluminux LL is added to restore the correct concentration, relevant to the amount of sodium aluminate (see above). Air agitation should be used in the tank after every addition to give thorough mixing.

Pre-Etch and Post-Etch Operations

Consistent uniform etching can only be obtained on clean aluminium surfaces; residues of oil buffing compounds and oxide will delay the etching process and produce a non-uniform finish. Novaclean 40 or Novaclean 19A are recommended for pre-cleaning.

For desmutting D-Ox 560 non-chromated liquid desmut is recommended.

5. EFFLUENT

Post-etch rinse waters may contain sulphide ions and generally a higher content of solids than when conventional caustic etches are used. Aeration of rinse tanks will minimise the sulphide content. Also, by running the post-etch and post-desmut rinses together to effluent, residues of desmut solution will often oxidise the sulphide and render the effluent acceptable.

The presence of sulphide ions in effluent may be established by the addition of sodium nitroprusside, which will give a purple colouration.

If sulphide is shown to be present in the effluent; it may be removed by addition of sodium hypochlorite solution. The amount may be determined by laboratory testing of a representative sample and sodium nitroprusside can be used to indicate its complete removal.

6. DISPOSAL

Should it be necessary in an emergency to dump a tank of **Aluminux LL** solution immediately, it should be treated with sodium hypochlorite or other recommended oxidising agent. As the alkalinity will also be required to be at least partially neutralised, considerable dilution will be required – therefore it is recommended that all rinse tanks and seal tanks be dumped at the same time as the etch bath.

7. HANDLING AND STORAGE

Normal precautions for the handling of caustic liquors must be observed. Delivery would normally be in bulk but if the product is delivered in drums, aluminium taps and connections must not be used under any circumstances.