Henkel Technologies

Technical Information Bulletin

TURCOFORM® ETCHANT ADDITIVE #3

AN ADDITIVE FOR CAUSTIC ALUMINUM ETCHANTS

DESCRIPTION:

TURCOFORM ETCHANT ADDITIVE #3 is a concentrated liquid additive developed for use with sodium hydroxide, flake or liquid, to make etchant solutions for aluminum alloys. When used as directed TURCOFORM ETCHANT ADDITIVE #3/sodium hydroxide solution will produce smoothly etched surfaces suitable for subsequent finishing operations such as anodizing or conversion coating.

LIQUID PROPERTIES:

Appearance:	Reddish, dark brown, liquid
Specific gravity:	1.395 ± 0.01
% Solids by weight:	49.5 ± 1%
Weight per gallon:	11.6 ± 0.1 lbs

TURCOFORM ETCHANT ADDITIVE #3 as provided, is a very concentrated solution which may crystallize in cold weather. Crystallization does not impair the activity of the product. The crystals will re-dissolve by warming the product or simply emptying the entire contents of the drum into the etch tank. Material remaining in the drum is then rinsed out into the etch tank with warm water.

USE INSTRUCTIONS:

A. Mixing:

1. Fill operating tank to _ of its operating capacity with tepid water.
2. Agitate water. Add 50 % sodium hydroxide solution to tank in recommended amounts.
3. Add TURCOFORM ETCHANT ADDITIVE #3 in the amount required by the particular etchant formula being used.
4. Add TURCOFORM ALKETCH INHIBITOR-L and any other ingredients required by the particular etchant formulation.
5. Refer to the individual TURCO Technical Data Bulletin for each etchant for initial charge, chemical control and rejuvenation instructions.

B. TURCOFORM ETCHANT ADDITIVE #3 may be used to make the following TURCOFORM ETCHANTS:

	100 LITERS FORMULAS		
TURCOFORM ETCHANT	**9H**	**11-L**	**17-L**
Water	34.0 L	34.0 L	34.0 L

Liquid caustic (50% NaOH)	12.6 L	13.6 L	23.0 L
TURCOFORM ETCHANT ADDITIVE #3	1.0 L	17.9 L	5.0 L
TURCOFORM ALKETCH INHIBITOR-L	11.0 L	3.0 L	
TRIETHANOLAMINE (T.E.A.)			3.0 L
Water	q.s.	q.s.	q.s.
Total Volume	100.0 L	100.0 L	100.0 L
N-1	12	13	22
N-2	4	2	1

NOTE:

- N-1 = the volume of 1.0 normal H_2SO_4, in ml, required neutralize the NaOH in a 5 ml sample of etchant to a pH of 113.
- N-2 = the volume of 1.0 normal H_2SO_4, in ml, required to neutralize the sodium aluminate in 5 ml sample of etchant from a pH of 11.3 to a pH of 8.2

C. REJUVENATION OF TURCOFORM ETCHANT 9H USING TURCOFORM ETCHANT ADDITIVE #3.

1. Maintain chemical control, N-1 and N-2, within the limits suggested in the TURCOFORM ETCHANT 9H Bulletin #395.

2. When using liquid caustic (50% NaOH) and TURCOFORM ETCHANT ADDITIVE #3 add 0.133 lbs (0.01 gallons) of 50% NaOH and 0.01 lbs of additive to each gallon of etchant to raise the N-1 value one unit.

3. **Example:** Assume a 1000 gallon etch tank at an N-1 of 8.0. We wish to raise the N-1 value to 10. An increase of 2 N-1 units.

Amount of 50% NaOH to be added:

(desired N-1) - (present N-1) x .133 lbs x gallons of etchant =(10.0 - 8.0) x 0.133 lbs x 1000 = 266 lbs

D. CONTROL OF "ACTIVE CONTENT" OF TURCOFORM ETCHANT ADDITIVE #3:

Titration Method:

(a) Add 50 ml of distilled water to a 250 ml iodine flask.
(b) Add 20 ml of 6N HCl (1:1) and swirl.
(c) Add 25 ml of 0.1 N iodine solution.
(d) Pipet 5.00 ml of the filtered sample into the flask. Stopper the flask and swirl to mix contents.
(e) Allow the flask to stand 10 minutes in darkness. Back titrate the iodine with 0.1 N sodium thiosulfate solution to the starch end point.
(f) The concentration of TURCOFORM ETCHANT ADDITIVE #3 active content equals (25 ml 0.1 N iodine) - (ml of 0.1 N sodium thiosulfate)

NOTE: After the TURCOFORM ETCHANT 9H is 4 to 8 mL or units. To raise the active concentration one unit, add 2 gallons of TURCOFORM ETCHANT ADDITIVE #3 to 1000 gallons of etchant.

E. CONTROL OF "ACTIVE CONTENT" OF TURCOFORM ETCHANT ADDITIVE #3 IN TURCOFORM ETCHANT #11-L:

Calorimetric Method:

(a) Filter 150 ml of hot etchant into a flask through Whatman #42 filter paper.

(b) Heat 50 ml of the filtered etchant to 85° to 95°C and hold at temperature for 5 minutes
(c) Transfer the heated sample into a 1 inch diameter Pyrex test tube.
(d) Immediately compare the sample to a freshly made, filtered and heated sample of TURCO-FORM ETCHANT #11-L in a similar test tube. It is important that the laboratory control etchant also be filtered and heated to 85° to 95°C and held for 5 minutes. If the intensity of the orange color of filtered etchant sample is less than that of the control proceed as follows:
(e) Add 100 ml of filtered etchant to a 250 ml stoppered cylinder.
(f) Add 3 ml of TURCOFORM ETCHANT ADDITIVE #3 and mix well.
(g) Repeat steps (b) through (d) increasing the addition of TURCOFORM ETCHANT ADDITIVE #3 by 3 ml each time until the color intensity of the sample is equivalent to the control.
(h) Add an equivalent amount of TURCOFORM ETCHANT ADDITIVE #3 to the etch tank.
(i) **Example;** Assume it was necessary to add 8 ml of TURCOFORM ETCHANT ADDITIVE #3 to 100 ml of filtered etchant. This is 8% by volume addition. If the tank volume is 1000 gallons then 8% of 1000 is 80 gallons which is the amount of TURCOFORM ETCHANT ADDITIVE #3 to be added to the etch tank.

NOTE: When TURCOFORM ETCHANT ADDITIVE #3 is used to make a TURCOFORM ETCHANT #11-L maintain the N-1 and N-2 values as recommended in Technical Data Bulletin No. 368.

ETCH FACTORS:

The etch factor obtained during etching may be varied by adjusting the concentration of the TURCO-FORM ETCHANT ADDITIVE #3 between the concentrations used in TURCOFORM ETCHANT 9H and TURCOFORM ETCHANT 11-L. As the concentration of TURCOFORM ETCHANT ADDITIVE #3 is increased beyond the concentration of TURCOFORM ETCHANT 9H the etch factor will begin to decrease in value. Lowest etch factors will be found when the concentration is used as in TURCOFORM ETCHANT #11-L. On 2024-T3 clad aluminum etch factors of .87 with the grain and .75 across the grain were obtained when using TURCOFORM ETCHANT ADDITIVE #3 as TURCOFORM ETCHANT #11-L. On 6061-T6 etch factors of .92 with the grain and .89 across the grain were obtained when using TURCOFORM ETCHANT ADDITIVE #3 as TURCOFORM ETCHANT #11-L. On both alloys excellent line definition was obtained and no end grain pitting was apparent.

DISPOSAL INFORMATION:

Dispose of spent solution per local, state and regional regulations. Refer to TURCO MATERIAL SAFETY DATA SHEET for additional disposal information.

DANGER! Contact may cause severe burns to skin and eyes.

TURCOFORM ETCHANT ADDITIVE #3 contains sodium hydroxide and sulfides. Avoid contact with eyes, skin and clothing. Do not take internally. Use with adequate (equivalent to outdoor) ventilation.

Protective clothing, such as a chemical face shield or goggles, gloves, boots and apron made from chemical resistant materials should be worn when handling and using this product. A NIOSH-approved respirator should be worn when working in confined or enclosed areas or during mist conditions.

Transport and store in closed containers at temperatures below 50°C away from acids, strong oxidizing agents and reactive metals, such as aluminum, tin and zinc.

Before using this product refer to container label and TURCO MATERIAL SAFETY DATA SHEET for additional precautionary, handling and first aid information.

NOTICE:

The above information and recommendations concerning this product are based upon our laboratory tests and field use experience with this or similar products. However, since conditions of actual use are beyond our control, any recommendations or suggestions are made without warranty, express or implied. Manufacturer's and seller's sole obligation shall be to replace that portion of the product shown to be defective. Neither shall be liable for any loss, damage, or injury, direct or consequential, arising out of the use of this product.