

**BONDERITE C-AK 33**  
**ALKALINE CLEANER**  
(KNOWN AS ALUMINUM ETCHANT 33)

Issued 8/16/2013

**1. Introduction:**

BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33) is a powdered, alkaline material used to produce a uniform, satin-like finish on aluminum and its alloys. The product is specially formulated to prevent scale formation caused by the precipitation of insoluble aluminum salts.

**2. Operating Summary:**

<u>Chemical:</u>	<u>Bath Preparation per 100 Gallons:</u>
BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33)	18 to 62 pounds
<u>Operation and Control:</u>	
BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33) Concentration	3 to 10 ounces per gallon
Aluminum Concentration	100 grams per liter maximum
Temperature	120° to 150° Fahrenheit
Time	1 to 15 minutes

**3. The Process:**

1. Clean
2. Water rinse
3. Etch with BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33) Bath
4. Water rinse
5. Desmut
6. Water rinse
7. Additional processing (e.g. anodizing)

**4. Material:**

BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33)  
Testing Reagents and Apparatus

**5. Equipment:**

The equipment used for the BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33) etch bath may be constructed of mild steel.



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To insure a uniform etch in the bath containing BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33), aluminum workpieces must be thoroughly cleaned using a nonsilicated cleaner prior to being placed in the etch bath. A mild etching alkaline cleaner is recommended.

Water Rinsing:

After cleaning, the metal must be thoroughly rinsed with water, preferably warm. The rinse should be overflowed continuously at a rate which will keep it clean and free from scum and contamination.

**7. Treating with the BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33) Solution:**Buildup:

18 to 62 pounds of BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33) per 100 gallons of solution.

Fill the tank about three-fourths full with water. Slowly add the proper amount of BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33) and circulate. Add sufficient water to bring solution up to working level and heat to operating temperature.

Operation:

Time: 1 to 15 minutes.

Temperature: 120° - 150° Fahrenheit.

After the best conditions for concentration, time and temperature have been established they should be maintained closely. Temperature should be held within  $\pm 5^\circ$  Fahrenheit.

**8. Testing and Control:**

Never pipet by mouth, use a pipet filler.

Free Caustic Soda and Aluminum Titration:

- a. Filter approximately 50 ml of BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33) bath through Whatman #541 filter paper.
- b. Fill a 5 ml pipet to the mark with the filtered sample. Caution: Baths with high aluminum content are highly viscous and may adhere to the outside of the pipet. Wipe the outside of the pipet with a clean paper towel, then add the 5 ml sample to a 250-ml Erlenmeyer flask.
- c. Add 50 ml of deionized water and 5 drops of Indicator 3.
- d. Fill the automatic buret to the zero mark with Titrating Solution 60.
- e. While stirring the sample, slowly run in Titrating Solution 60 from the automatic buret until the pink color disappears.
- f. Record the number of milliliters of Titrating Solution 60 used as Titration A.
- g. Refill the automatic buret to the zero mark with Titrating Solution 60.



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- h. To the sample, add 5 grams of Reagent 6 and swirl to dissolve. If the sample turns pink, proceed to the next step. If the sample remains colorless, then Titration B is zero and proceed to Step I.
- i. While stirring the sample, slowly run in Titrating Solution 60 from the automatic buret until the pink color disappears.
- j. Add an additional 5 grams of Reagent 6 to the sample. Swirl to dissolve. Let stand for 1 minute. If the sample turns pink, continue to titrate with Titrating Solution 60 until the pink color disappears. Do not refill the automatic buret to the zero mark.
- k. Repeat Steps i and j until a colorless sample is obtained after the addition of Reagent 6.
- l. Record the number of milliliters of Titrating Solution 60 used as Titration B.

The dissolved aluminum content of the etch bath is calculated as follows:

$$\text{g/liter of Aluminum} = \text{Titration B} \times 2.2$$

The effective BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33) content of the bath can be calculated from the equation:

$$\text{BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33) content (oz per gal)} = F \times ([3 \times \text{Titration A}] - \text{Titration B})$$

The factor F is dependent on the dissolved aluminum content of the etch bath as indicated below:

<u>Al (g/l)</u>	<u>F</u>	<u>Al (g/l)</u>	<u>F</u>
0-10 .....	0.40	70 .....	0.33
20 .....	.38	80 .....	.32
30 .....	.37	90 .....	.31
40 .....	.36	100 .....	.30
50 .....	.35		
60 .....	.34		

**Replenishment:**

Depending on the aluminum content, the BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33) concentration should be kept between 3 to 10 ounces per gallon. To increase the BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33) by 0.1 ounce per gallon, add 0.63 pound of BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33) per 100 gallons of etch solution.

**9. Operation Recommendations:**

As the BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33) etch bath is used, the aluminum content will increase. Optimum etching characteristics of the bath are attained if the BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33) concentration is increased as the aluminum content increases:



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<u>Al (g/l)</u>	<u>BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33) (oz/gal)</u>
0 - 40 .....	3 - 4
40 - 60 .....	4 - 6
60 - 80 .....	6 - 8
80 - 100 .....	8 - 10

Once the aluminum content of the bath exceeds 100 g/l, the bath may no longer retain its ability to hold solids in solution and will start to precipitate sludge. At this point, a portion of the bath should be discarded.

Since the etching characteristics of baths with very low (<20 g/l) aluminum contents are different from those of baths with higher aluminum contents, frequent partial dumps are better than less frequent, complete dumps.

**10. Storage Requirements:**

BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33) is a free-flowing powder and is not affected by freezing temperatures. However, it is recommended that the product be stored indoors in a cool, dry place. Keep unused portion of drums tightly closed.

**11. Waste Disposal Information:**

Applicable regulations covering disposal and discharge of chemicals should be consulted and followed.

Disposal information for BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33) is given on the Material Safety Data Sheet.

The processing bath is alkaline and may require waste treatment and neutralization prior to discharge.

**12. Precautionary Information:**

BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33) exhibits no special toxic hazards. However, since the product is highly alkaline, it is recommended that protective goggles or glasses and gloves be worn when handling the concentrated product. Do not add powdered product to hot working baths or hot water.

The caustic etching bath is strongly alkaline and can cause severe burns to eyes, skin and mucous membranes. Do not get in eyes, on skin or on clothing and do not take internally. Use goggles and face shield and additional protective equipment to minimize the possibility of contact with the solution. For additional information refer to the Material Safety Data Sheet for BONDERITE C-AK 33 (known as ALUMINUM ETCHANT 33).



## BONDERITE C-AK 33 ALKALINE CLEANER (KNOWN AS ALUMINUM ETCHANT 33)

### Testing Reagents and Apparatus

(Order only those items which are not already on hand)

<u>Code</u>	<u>Quantity</u>	<u>Item</u>
592477 .....	1 .....	Buret Assembly, 25-ml Automatic, Glass
592488 .....	2* .....	Flask, Erlenmeyer, 250-ml, Glass
592398 .....	1 qt .....	Indicator 3 (Phenolphthalein)
592474.....	1 .....	Indicator Bottle, Clear Plastic, 30-ml
592491 .....	2* .....	Pipet, 5-ml Volumetric, Glass
592494 .....	1 .....	Pipet Filler
592499 .....	1 .....	Pitcher, Graduated, Plastic
595584 .....	1 .....	Pocket Thermometer (0-220°F)
592414 .....	8 oz .....	Reagent 6 (Sodium fluoride)
592440 .....	1 gal .....	Titrating Solution 60 (1.0N Hydrochloric acid)
595168 .....	pack .....	Whatman #541 Filter Paper

\* Includes one more than actually required, to allow for possible breakage.

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