Product Data Sheet

Cee-Bee® A-663

Cee-Bee® A-663 is a chrome-free, medium-to-heavy duty deoxidizer that will deoxidize, desmut, and etch aluminum and aluminum alloys prior to dye penetrant inspection, anodizing, resistance welding, and conversion coating.

Conforms To

- Lockheed
- United Launch Alliance

Benefits

- Contains no chromium in any oxidation state.
- Can be used in both spray and immersion applications.
- Effectively removes surface oxides, surface discoloration due to heat treatment, and smut resulting from alkaline etching or chemical milling.
- Increased bath life when processing copper containing alloys.
- Simple titrations can control system components.
- No heat required.

Properties

- Greenish brown liquid
- Acidic
- pH less than 1

Notes Prior to Handling

Before using your Cee-Bee® products, all safety and operating instructions should be read and understood. If you have any questions, please contact your Cee-Bee® representative before proceeding.

Use Procedure

Equipment

- The process tank, all piping, pumps, and associated equipment should be fabricated from stainless steel (316L preferred) or acid resistant plastic. All pump seals, valve seats, and other elastomers which come in contact with the solution should be EPDM, Teflon, or Viton.

Make Up Instructions

1. Fill the tank 50% full with clear, ambient temperature water.
2. Slowly add 25% (by volume of final working solution) 42° Baumé Nitric Acid. This is 350 g/liter 42° Baumé Nitric Acid.
3. The operating range is 20% - 30% by volume 42° Baumé Nitric Acid. This is 280 – 420 g/liter 42° Baumé Nitric Acid)
4. While mixing, slowly add 15% (by volume of final working solution) Cee-Bee® A-663. This is 195 g/liter Cee-Bee® A-663.
5. The operating range 12.5% - 17.5% by volume Cee-Bee® A-663. This is 162.5 – 227.5 g/liter of Cee-Bee® A-663.
6. Add water to bring bath up to final working volume.
7. Agitate solution (either air or mechanical) for 50-60 minutes.

Operating Temperature

- Operate solution within a temperature range of 65° – 78° F (18°C - 26° C). Heating is not necessary unless the temperature falls below 65°F (18°C). It must be noted that there is an increase in metal removal (etch rate) as the temperature increases. A new solution will generate more heat (exothermic) when first made up; however, it will stabilize over a couple of days. Air agitation helps assist in reducing this exothermic condition.

Processing Time

- Processing times will vary with alloy, condition of bath, amount of oxide/discoloration/smut on the part, and temperature. Generally, 2-10 minutes for immersion and 30 seconds to 5 minutes for spray.

Rinsing

- Immediately rinse parts in cold water by immersion with air agitation or by spray. These tanks should be overflowed to control build up of contaminants.

Safety, Handling, and Precautions

- **WARNING!** Can cause severe burns to eyes and skin. Wear face shield, gloves, boots and other proper protective clothing sufficient to avoid contact with eyes and skin. Proper eye protection is always absolutely essential.
- In case of accidental contact, flush area with water for at least 15 minutes. Seek medical attention promptly if irritation persists.
- Avoid splashing nearby personnel during spray rinsing.
- Avoid breathing spray mist.
- Use adequate ventilation.

Solution Control

Nitric Acid Titration

Reagents and Equipment

- 250 ml Erlenmeyer Flask
- 5 ml Volumetric Pipet
- Phenolphthalein Indicator
- Deionized or Distilled Water
- 50 ml Graduated Cylinder
- 25% KF Solution
- 1.0N NaOH Titrating Solution

Testing Procedure

1. Add 50ml of deionized or distilled water into a 250 ml Erlenmeyer flask.
2. Pipet a 5 ml bath sample of Cee-Bee® A-663 bath to the flask.
3. Add 15 ml of 25% KF Reagent solution and 5 drops of phenolphthalein.
4. Titrate the sample with 1.0N NaOH to a permanent pink endpoint.
5. Calculate:
    a. ml of 1.0N X 1.2 = % by volume of 42° Baumé Nitric Acid.
6. Operating range is 20% - 30% by volume 42° Baumé Nitric Acid. (280 – 420 g/liter 42° Baumé Nitric Acid).

Solution Control (Continued)

Concentration of Cee-Bee® A-663

Reagents and Equipment

- 250 ml Graduated Glass Beaker
- 5 ml Volumetric Pipet
- Magnetic Stir Bar
- Thermometer
- 0.05M EDTA Standard Solution
- Boric Acid, A.C.S. Reagent Grade
- pH Meter and pH Electrode; Calibrated
- Hotplate – Magnetic Stirrer
- Magnetic Stirrer
- 50 ml Buret
- 5-Sulfosalicylic Acid, A.C.S Reagent Grade
- Deionized or Distilled Water

Testing Procedure

1. Pipet a 5 ml bath sample of Cee-Bee® A-663 bath into a 250 ml graduated beaker.
2. Dilute to the 125 mL mark with DI or distilled water and add a magnetic stir bar.
3. Add 1-2 g of boric acid and stir until solids dissolve completely.
4. Insert pH electrode(s), stir and measure the pH while adding small quantities of glycine until the pH is 2.5. Remove the electrodes, rinsing thoroughly with DI water back into the beaker.
5. Place on hotplate-stirrer and warm to between 45°C and 50°C.
6. With stirring, add 1g of 5-sulfosalicylic acid. Solution will turn dark red. Titrate with 0.05M EDTA standard solution until a pure yellow color appears. This is the endpoint.
7. Confirm the endpoint by adding a few more crystals of the 5-sulfo salicylic acid. The solution should remain yellow. If not, continue adding the 0.05M EDTA standard solution dropwise until it returns to a pure yellow color.
8. **The temperature of the solution must not fall below 40°C during the entire procedure. If it does, heat it to between 40°C and 45°C again before continuing.**
9. Calculate:
    a. % by volume of Cee-Bee® A-663 = mL 0.05M EDTA x 0.575
10. Operating range = 12.5% - 17.5% by volume Cee-Bee® A-663.

Etch Rate

- The etch rate of the bath can be measured using the formula below:

$$Etch\ Rate = \frac{(I - F)(Th)30}{(I)(I.T.)} = mil/surface\ /hour$$

I = Initial mass (grams)
F = Final mass (grams)
Th = Initial Thickness (mils)
I.T. = Immersion Time (minutes)

- A 2024 clad panel immersed in a non-agitated solution of Cee-Bee® A-663 should exhibit an etch rate of 0.1 – 0.4 mils/side/hour. The etch rate can be maintained by periodic additions of Ammonium Bifluoride along with base material of Cee-Bee® A-663.

Addition of ABF to Cee-Bee® A-663 to Increase Etch Rate

There is a simple formula that can be used to estimate how much ammonium bifluoride (ABF) is needed to increase the etch rate. You must know the current (measured) etch rate and the etch rate you are trying to achieve (desired). These rates should be in mil/side/hr. to work. The formula is:

(Etch rate desired – Etch rate measured) x 11.8 = grams of ABF to add per liter of bath. If you want the answer in pounds per 100 gallons, then the factor is 9.85 rather than 11.8.

Caution! This formula works well until you have aluminum buildup in the bath. Then you will probably need to add more than the formula calls for. The reduction in rate is not because the fluoride is decreasing but rather that the aluminum is building up in the bath and inhibits etching – both by tying up fluoride and opposing the dissolution of Al (Le Chatelier principle). That is why we do not measure fluoride since that number is not valid.

Contact Us

United States
McGean
Phone: +1-216-441-4900
Fax: +1-216-441-1377
Email: Aviation@McGean.com

United Kingdom
McGean-Rohco (UK) Ltd.
Phone: +44-1902-456563
Fax: +44-1902-457443
Email: Aviation@McGean-Rohco.co.uk

Singapore
McGean Singapore
Phone: +65-6863-2296
Fax: +65-6863-2297
Email: Info@ceebee.com.sg

China
Cee-Bee Aviation Materials (Xiamen) Co. Ltd.
Phone: +86-592-551-3689
Email: Info@ceebee.com.cn

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