



# **Surface Technologies**

Technical Process Bulletin

## **Alocrom 1200**

A rapid non-electrolytic dip which gives excellent protection against corrosion to both painted and unpainted aluminium surfaces

### **1. PRODUCT DESCRIPTION**

A rapid non-electrolytic dip process, which forms a protective golden coloured chromate coating on aluminium and its alloys.

### **2. FEATURES**

#### **Excellent Corrosion Resistance**

**Alocrom 1200** gives excellent protection against corrosion to both painted and unpainted aluminium surfaces.

#### **Flexible Adherent Coatings**

**Alocrom 1200** coatings are integral with the metal and will withstand bending and denting of the surface.

#### **Maximum Paint Adhesion**

**Alocrom 1200** provides an excellent foundation for paint and other organic finishes.

### **Short Immersion Time**

**Alocrom 1200** requires only a few minutes for coating formation.

### **Negligible Heating Costs**

**Alocrom 1200** operates at room temperature and the work can be air dried where convenient.

### **Low Coating Costs**

For a medium weight coating only about 0.25 kg of **Alocrom** is used in processing 100 m<sup>2</sup> (1000 sq ft) of metal surfaces.

### **Low Electrical Resistance**

Light to medium **Alocrom** coatings have minimum effect on surface electrical resistance. The contact electrical resistance is less than 5000 micro-ohms per square inch measured under an applied electrode pressure of 200 pounds per sq inch. (MIL-C-5541 method).

### **Approvals**

**Alocrom 1200** is approved to DEF STAN 03-18 Certificate No. 031801 for use on aircraft, (including special approval for repairing damaged anodic coatings). Outside the UK the process is known as Alodine 1200; **Alocrom 1200** and Alodine 1200 are chemically identical. Alodine 1200 features on the QPL for MIL-C-5541 (classes 1A & 3).

## **3. USES**

**Alocrom 1200** is ideal for coating all types of aluminium and aluminium alloys including high silicon pressure die-castings. It should be used on aluminium wherever maximum corrosion resistance is required, and is suitable for articles which are to be painted or left unpainted. Its uses include general industrial work, electrical components, domestic appliances, car body parts and aircraft components. **Alocrom 1200** is unaffected by steel, brass or copper inserts in the articles being processed and can be used for treating zinc and aluminium in the same bath.

**Alocrom 1200** is unsuitable for producing a decorative effect on unpainted alloys which are subject to exterior weathering since some change in colour may occur under these conditions. The process should not be used to treat foodstuffs containers.

For large scale continuous production, **Alocrom 1200** may be applied in a conventional spray washing plant.

For brush application use only Brush Alocrom 1200 liquid. This product is supplied as a two pack product. **Do not use the powder to make up Alocrom 1200 for brush application** and especially **do not store working strength brush Alocrom 1200 solution** as toxic cyanide fumes can accumulate in a closed container.

#### 4. **ALOCROM 1200 BATH CONTROL POINTS**

Temperature:	18-27°C (65-80°F )
Immersion Time:	2 - 5 minutes
Coating Weight:	0.3 - 2.0 g/m <sup>2</sup> (30-200 mg/sq ft)
Chemicals Required:	Alocrom 1200 powder. Nitric Acid may also be required
Bath Make-up:	8 kg Alocrom 1200 per 1000 litres of water
Bath Strength Titration:	3.3-4.0 cm <sup>3</sup>

#### 5. **PROCESS**

The complete pretreatment process consists of the following steps:

- a. Preclean by solvent vapour degreasing or by using a suitable Ridoline, Novaclean or Almeco cleaner plus water rinse.
- b. Deoxidise or Desmut where necessary followed by a water rinse.
- c. Alocrom treatment.
- d. Water rinse.
- e. Deoxylyte rinse and/or deionised water rinse.

See Section 7 - OPERATING NOTES for further details concerning steps a) and b).

#### 6. **ALOCROM 1200 BATH MAKE-UP**

## 6.1 Chemicals Required

The process requires Alocrom 1200 powder and, in some cases, small regular additions of concentrated nitric acid during replenishment.

## 6.2 Precautions for Make-Up and Replenishment

Before opening the Alocrom 1200 container refer to Section 12 - HANDLING PRECAUTIONS.

## 6.3 Make-up

Fill the bath to its operating level with water. Deionised or distilled water is recommended to prevent calcium or magnesium salts precipitating out and reducing the efficiency of the bath. Slowly add 8 kg of Alocrom 1200 powder per 1000 litres of water and stir well until the powder has completely dissolved. The tank extract system must be running during bath make-up.

For the best results, a new bath should age for 24 hours and it should therefore be made up at least a day before production commences.

## 7. ALOCROM 1200 BATH CONTROL

### 7.1 Alocrom Titration

- a. Adjust the Alocrom bath to its normal working level with water and stir.
- b. Pipette 5 cm<sup>3</sup> of the Alocrom bath into a 250 cm<sup>3</sup> flask and dilute to about 100 cm<sup>3</sup> with water. Take care that none of the solution is spilt throughout the test.
- c. Add about 1 gram of potassium iodide and agitate to dissolve.
- d. Add about 5 cm<sup>3</sup> of concentrated hydrochloric acid and mix. Leave to stand for about 1 minute.
- e. Titrate the solution with 0.1N sodium thiosulphate until a straw colour is obtained.
- f. Dissolve about 0.5 grams of iodine indicator (Iotect) in water and add to the flask. A blue-black colour will be obtained. Continue the titration to the colourless end point.

The number of  $\text{cm}^3$  of sodium thiosulphate added is the strength titration of the bath and this should be maintained at 3.3 - 4.0  $\text{cm}^3$ . Add 2 kg of Alocrom 1200 powder per 1000 litres of bath for each  $\text{cm}^3$  below the required value.

**Refer to Section 12 - HANDLING PRECAUTIONS before opening the Alocrom 1200 container**

## **7.2 pH Control**

For correct coating formation, Alocrom baths should be operated at a pH between 1.6 and 2.2. If the coating takes longer to form than normal and is lighter coloured or non-adherent, this indicates that the pH is rising and it should be lowered by adding concentrated nitric acid when replenishing the bath. Initially, add 100  $\text{cm}^3$  of acid for each 4 kg of Alocrom needed to replenish the bath; if necessary increase the amount in 100  $\text{cm}^3$  increments, up to a maximum of 1 litre/4 kg until consistent coatings are obtained. The amount of nitric acid added must be kept as low as possible and the maximum must not be exceeded. After each addition of acid, wait for several hours before adding more acid to ensure the bath has reached equilibrium.

If preferred, the pH can usually be lowered by increasing the Alocrom concentration rather than adding concentrated nitric acid. To do this add Alocrom in 1 gram per litre increments until consistent coating are obtained. The total Alocrom concentration must not exceed 14 kg per 1000 litres which corresponds to a titration of 7  $\text{cm}^3$ . Once the optimum operating strength for a particular plant has been established, the bath should be maintained at that strength by small additions of Alocrom 1200 powder as indicated by titration.

## **8. OPERATING NOTES**

### **8.1 Precleaning**

Remove all grease by solvent vapour degreasing or by using Ridoline, Novaclean or Almeco cleaner. Rinse where necessary.

If the oxide skin is very light no further precleaning is required. However, if the oxide skin is heavier eg. on extrusions, heat treated sheet aluminium or cast alloys etc, it will normally need removing with Deoxidiser. See Data Sheet on Deoxidisers 1, or 7/17 for details.

Copper containing alloys tend to smut in etching alkali cleaners and the

copper smut should be removed by dipping the component in 10% nitric acid or Deoxidiser 7/17. Alloys containing more than about 1% of silicon, such as those commonly used for die castings, give a silicon smut if etched in alkali and this cannot be removed by nitric acid or any other practicable methods. Such alloys are best solvent degreased and given a light etch in Deoxidiser 7/17 before the Alocrom treatment.

## **8.2 Alocrom Treatment**

Immerse in the Alocrom 1200 bath for 2-5 minutes at 18-27°C. After removing the work from the bath allow it to drain over the tank for 15 seconds. This will avoid unnecessary contamination of the rinse and reduce drag out losses.

## **8.3 Alocrom Coating Control**

Baths operating correctly give thin, adherent coatings ranging in colour from iridescent gold to golden yellow. Typical coating weights are in the range 0.3 to 2.0 g/m<sup>2</sup> (30-200 mg/sq ft).

If the coating does not form or is too light or too iridescent, the cause may be one or more of the following:

- a. The bath temperature is too low for the immersion time.
- b. The immersion time is too short.
- c. The concentration of the bath is too low.
- d. The pH of the bath is too high.
- e. Heat treatment residues or an oxide layer on the metal surface are preventing coating formation, these can be removed with Deoxidiser (see relevant Data Sheet for details).
- f. The bath has been overheated. This can permanently upset the chemical balance of the solution.
- g. The bath has become contaminated with phosphates, sulphates, etc., from a prior cleaning bath.

If the coating is too heavy or dark, the causes may be one or more of the following:

- a. The bath temperature is too high for the immersion time.

- b. The immersion time is too long.
- c. The concentration of the bath is too high.
- d. The pH of the bath is too low.

If the coating is powdery, the cause may be one or more of the following:

- a. The work has been improperly cleaned and/or rinsed.
- b. The bath has become contaminated.
- c. The surface oxide has not been adequately removed. Treat with Deoxidiser.

#### **8.4 Alocrom Bath Maintenance**

Restore the working level of the bath regularly with water to make good evaporation and drag-out losses.

If any sludge accumulates and begins to interfere with the processing, the bath should be cleaned out. To do this allow the sludge to settle, siphon or pump the clear solution into the emptied rinse tank and discard the sludge. Wash out the Alocrom tank and return the solution. Fill the bath up to its operating level with water and add Alocrom to bring the bath to its working strength.

Alocrom baths have a very long life and for all practical purposes need never be discarded.

### **9. RINSING**

Rinse for 15-30 seconds in clean running water. The rinse water flowing to drain will contain a low concentration of chromates (hexavalent chromium). A typical figure would be 15 mg/l (ppm) Chromium (as Cr), and this may need effluent treatment to satisfy the requirements of the Drainage Authority. Details of a simple effluent treatment method will be supplied on request.

If the work is to be painted, rinse finally in deionised water, or alternatively mains water containing Deoxylyte (see the relevant Product Data Sheet for details). To help dry the work this rinse can be heated to 50-70°C. Deoxylyte in the final rinse counteracts the effects of any hardness in the final rinse water and improves the corrosion resistance. It also acidifies the surfaces before drying and thereby ensures good paint adhesion even under prolonged humid

conditions. Alternatively, Alocrom 1200 can be used for the same purpose. Add 50-250 grams of Alocrom 1200 per 1000 litres of final rinse. The pH should be 3-5. Deionised water may be required to achieve this pH.

The final rinse must be kept clean and it should be renewed once a day or, for continuous production, once a shift. Use deionised or distilled water for final rinse make-up if possible.

## 10. DRYING

Air or oven dry the work. Oven drying speeds up production and a peak metal temperature of 70°C is recommended. At higher temperatures, there may be some loss of corrosion resistance, particularly on copper bearing alloys or where articles are to be left unpainted.

There is no restriction on the stoving temperature of paint or other organic coatings applied over the Alocrom.

The freshly formed Alocrom coating is quite soft and care must be taken not to damage it during rinsing and drying. When dry, Alocrom treated parts may be painted or put into service without further treatment.

Operators should wear cotton gloves when handling freshly treated work.

## 11. REMOVAL OF ALOCROM COATINGS

Fresh Alocrom 1200 coatings may be removed without seriously etching the aluminium by immersing in 50% nitric acid or in the Deoxidiser bath. Aged coating or those which have been heated are very resistant to chemical methods of removal and an etching alkali will be necessary.

## 12. EQUIPMENT

The equipment consists of:-

- a. Degreasing plant with suitable rinses where required and if necessary a Deoxidiser or Desmut tank and rinse.
- b. An Alocrom tank constructed of 18 gauge type 316 (En58J) stainless steel or rigid PVC, neoprene, polypropylene, glazed fibre glass or polythene. Rubber, lead, ceramic or glass are not suitable. It is not usually necessary to heat the tank but if the temperature of the shop is likely to fall below 18°C, a steam coil or electric immersion heater should be fitted to the tank. The solution deteriorates rapidly if heated above 35°C and a thermostat **MUST** be fitted to a heated tank. Overheating the Alocrom

may result in the formation of toxic fumes.

The tank should be sited in a well ventilated area and fitted with a properly designed extract system. As a guide, air velocity across the Alocrom should be about 25 m/min. Tanks over 75 cm<sup>3</sup> wide should have extract slots on both sides. Typical slot velocity will be 700 m/min.

Further information on tank extract design can be obtained from 'Industrial Ventilation' published by American Conference of Government Industrial Hygienists (ACGIH).

- c. An unheated water rinse tank and a final dilute Deoxylyte or dilute Alocrom rinse tank. The water rinse tank should have a continuous supply of water, a weir overflow and a draining valve; the final rinse tank should be fitted with heating coils.
- d. A well ventilated oven for drying the work if required.

Work can be handled on hooks or in baskets or tumbling barrels. Containers which are immersed in the solution should be of stainless steel, heavy gauge aluminium or plastic coated mild steel. Care must be taken to ensure that the solution can circulate freely to all parts of the work.

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## 13. HAZARDS AND HANDLING PRECAUTIONS

### 13.1 Alocrom 1200 as supplied

Full information on hazards and safe handling of the chemical as supplied is given in the Health and Safety Data Sheet which must be read and understood by everyone handling or using the product.

**Alocrom 1200** contains chromium trioxide (chromic acid) complex fluoride salts and potassium ferricyanide (potassium hexacyanoferrate III).

When handling the products wear PVC or rubber gloves, apron and rubber boots. Wear chemical goggles and/or a face shield which conforms to BS 2092 and 'The Protection of Eyes Regulations 1974'. Wear a dust mask to BS 2091. Handle only in conditions of good ventilation.

OPEN CONTAINERS OF ALOCROM WITH CAUTION AND ALLOW ANY VAPOURS TO DISPERSE AND ANY DUST TO SETTLE FOR SEVERAL MINUTES BEFORE HANDLING THE POWDER. DO NOT BREATHE THE DUST.

### **13.2 Alocrom working bath**

Operators should wear chemical goggles and/or a face shield which conforms to BS 2092, and PVC or rubber gloves.

#### **First Aid**

#### **Skin Contact**

Remove contaminated clothing immediately. Drench the affected area with water and continue thorough washing with soap and water. Get medical attention if irritation or a skin rash develops.

#### **Eye Contact**

Flush eyes with large quantities of cool water holding eyelids apart. Continue irrigation for at least 10 minutes. **GET MEDICAL ATTENTION IMMEDIATELY.**

Spills should be contained or absorbed using inert material. Do not allow rags, sponges, paper or any organic matter which has become contaminated with Alocrom to dry out as this may constitute a fire hazard. Wash rags etc. with water and discard to a fireproof container.

## **14. FURTHER INFORMATION**

Full information on the hazards and safe handling of the product as supplied is given in the Health & Safety Data Sheet which must be read and understood by everyone handling or using this product.

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