



## Determination of the sulphate concentration for chrome baths

To ensure a high quality result when using chrome baths their sulphuric acid concentration must be maintained at an optimum level. This concentration will change over time with use of a chrome bath.

As a preventive measure, samples should therefore be taken from chrome baths at regular intervals to determine their sulphate concentration. Sulphates are the salts of sulphuric acid. The sulphate concentration provides information on the concentration of sulphuric acid in a chrome bath.

In the past the sulphate content was determined in the laboratory of the bath manufacturer. This practice is still adopted to some extent today, but means that the users of the bath have to send the samples to the lab of the manufacturer and perform only a small amount of lab work themselves.

However, many chrome bath users now believe that the determination of sulphate concentration should be carried out at the point of use of a bath in view of the increased certification requirements for chrome-plating facilities.

## Advantages

- 1. It is not necessary to wait several days between sampling and the results of analysis**
- 2. It is not necessary to satisfy the requirements of dangerous goods regulations for the transport of samples**

## Procedure

Hydrochloric acid is added to chrome bath liquid that has been filtered or centrifuged to remove dirt particles. The contents of the tubes are mixed, barium chloride is then added and the mixing step is repeated.

**Result:** The sulphate is precipitated in crystalline form. The quantity of sulphate precipitated is determined either

- through evaporation and subsequent weighing
- through centrifugation, then recording the level on the centrifugation (chrome bath) tube and calculation using the Factor (F) previously determined

## Sulphate determination through centrifugation

### Apparatus and reagents:

- Hydrochloric acid diluted 1:1 (initial concentration of the HCl: 37 %)
- Barium chloride solution 20 %
- Centrifuge
- Centrifuge tubes (chrome bath tubes), graduated
- Timer

### Method:

Pipette 5 ml hydrochloric acid into each of 2 chrome bath tubes (Art. No. 0534).

Add 20 ml chrome bath liquid to each tube, seal the tubes with the rubber stoppers (Art. No. 0535), then shake / mix for approx. 15 seconds.

Remove the rubber stopper and place the tubes facing each other in the centrifuge. Centrifuge them for 5 minutes at 2,500 min<sup>-1</sup>.

Read off the level of the sediment = **A**

Pipette 5 ml barium chloride solution into each of the tubes and shake / mix them for approx. 15 seconds. Wait 10 minutes for the precipitation to take place.

Remove the rubber stoppers and insert the tubes in the centrifuge so that they face each other. Centrifuge them for 10 minutes at 2,500 min<sup>-1</sup>.

Remove the tubes from the centrifuge and tap them until the sediment is level (e.g., against a rubber mat or the wood of the workbench).

Read off the level of the sediment = **B**

## Calculation:

$$C = (B - A) \times \text{Factor}$$

- C** = Concentration of sulphate in g/l chrome bath  
**A** = Graduation mark for the sediment before sulphate precipitation  
**B** = Graduation mark for the entire sediment

## Calculation of Factor:

$$\text{Factor} = E : D$$

- D** = Graduation mark for the sediment of the standard solution  
**E** = Sulphate concentration of the standard solution in g/l

The same procedure is adopted to determine the factor as for determination of the sulphate concentration, but with 20 ml standard solution instead of the chrome bath sample. The standard solution can be obtained from the manufacturer of the chrome bath.

### Important:

The rubber stoppers are to be used only to seal the tubes when shaking or mixing them. They must not be used during the centrifugation procedure!

When centrifuging the tubes must face one another and have the same weight!

If a tube filled with water is used to balance the centrifuge it must be weighed to make certain that it has the same weight as the other tube because of the difference in specific weight.

## Ordering information

Centrifuge	Quantity	Cat. No.
ROTOFIX 32 A	1	1206

Accessories	Quantity	Cat. No.
4-place rotor	1	1624
round carrier	4	1481
rubber insert	4	0765
chrome bath tube	4	0534
rubber stopper	4	0535