



PreTreat

Bringing new ideas to the surface

Technical Data Sheet

Titration Training Testing Guide

Code: N/A

Version: N/A | Issued: Aug 2026

INTRODUCTION

Control of your surface treatment tanks/baths is vital to ensure the highest possible quality and to obtain the best economic use of the chemicals you use.

The easiest and fastest way to get an accurate control point is by carrying out a **TITRATION** on the bath solution.

A titration is a method that will allow you to determine the concentration of a solution and therefore the precise quantity of a product in the working solution.

The method will involve taking a sample of the working solution and adding to it an **INDICATOR**, then adding a second solution of known strength. The indicator will change colour when the reaction between the working solution and the second solution is complete.

PreTreat Ltd issues technical data sheets (TDS) which give the exact details of the titration method. If the method is followed, then the working solution can be controlled according to the running specification(s) established for your particular process.

The following guide is intended to make it easier for you to be able to carry out the titrations you require to control your tanks correctly.

EQUIPMENT

The following list of equipment is required to carry out titrations, although the individual TDS will detail exactly what is required.

DO NOT worry if you don't have the exact equipment as shown below; you will have an equivalent which will still do the job.

SAFETY NOTICE: The chemicals used can be harmful/corrosive, so eye protection must be worn.



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Plastic syringe for measuring the working solution



Glass conical flask for carrying out the titration reaction. Used when the solution needs to be heated



Plastic beaker used to carry out the titration reaction. (Not suitable for heating)



Indicator storage & dropping bottle



Self-zeroing burette. This holds the second solution used in the titration reaction



Safety glasses. The chemicals used in titrations can be corrosive



TITRATION PROCESS

The Technical Data Sheets supplied for the PreTreat Ltd products in use will detail the method and reagents needed to carry out the titration relevant to that product.

The following is a typical method:



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Pointage Titration

Measure 10 cm³ of the bath into a flask and add 4 – 6 drops of Phenolphthalein Indicator solution. Titrate with 0.1 M Sodium Hydroxide until the colour changes to a permanent pink.

In this method, the burette will be filled with the 0.1 M sodium hydroxide solution. It is vital that the burette is zeroed before use and that it does not go beyond its capacity (usually 20 cm³ or 25 cm³). Once it reaches its capacity, it will need to be re-zeroed, and the titration carried on with. The result will be the total volume of the 0.1 M sodium hydroxide added in cm³.

It is important that the amount of solution added from the burette is accurately measured.

In this example, the reading is 21.3 cm³



The pink colour is the endpoint



The result will give you a figure which will then be compared to the running specification. If it is within the spec, then no further action is needed.

If it is lower than the spec, then extra product will need to be added to the process tank in accordance with the TDS replenishment. This will usually be “add X litres of product per 1000 L of bath”. It is good practice to re-check the titration after any addition and make a note of the amount added.

The table below shows how the results can be recorded. It will help if the actual working volume of the bath is known; this will help calculate the amount of product needed. (The overall tank volume is not the same as the working volume).



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Date of Test	Titration Result (mL) (spec 8.0 – 10.0 mL)	Action Required
01-08-26	9.6	None (bath is in spec)
08-08-26	7.5	Bath below spec - Add 1 L/1000 L
08-08-26	8.2 (Re-test)	None (addition got bath in spec)

If the result is higher than the spec, then no addition is required, but the bath may be too concentrated and could result in coatings of a lesser quality. It may just need more water to bring down the concentration.

The titrations that are carried out can be broadly covered in the following sections:

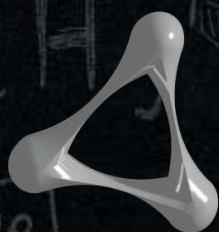
- 1) An acid-based working bath using alkali titrating solution,
- 2) An alkaline-based working bath using acid titrating solution,
- 3) Chromic acid-based working bath using sodium thiosulphate solution.

For each titration, there will be different amounts of bath solution and different strengths of titrating solution used.

IT IS ESSENTIAL THAT THE TECHNICAL DATA SHEET IS READ AND THE TITRATION CARRIED OUT AS DESCRIBED.

Determining the end point of the titration can be quite tricky; it involves a colour change and ideally should be carried out in good light conditions.

The section below gives the colour changes for the indicators that are used most commonly.



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PHENOLPHTHALEIN

The colour change is:
COLOURLESS to PINK



BROMOPHENOL BLUE

The colour change is:
YELLOW to BLUE



INDICATOR 11-13

The colour change is:
YELLOW TO VIOLET



METHYL ORANGE

The colour change is:
YELLOW to RED



BROMOCRESOL GREEN

The colour change is:
YELLOW to BLUE





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The titration to measure the Chrome (vi) level is detailed on TDS such as Alocrom 1200 (**Chromcote 7420**), Alocrom 407/47 (**Chromcote 7407**), **Walterisation® 7460**, etc

A chrome (vi) solution before any additions or titration.
Note the yellow colour; this is normal for Cr(vi) solutions.



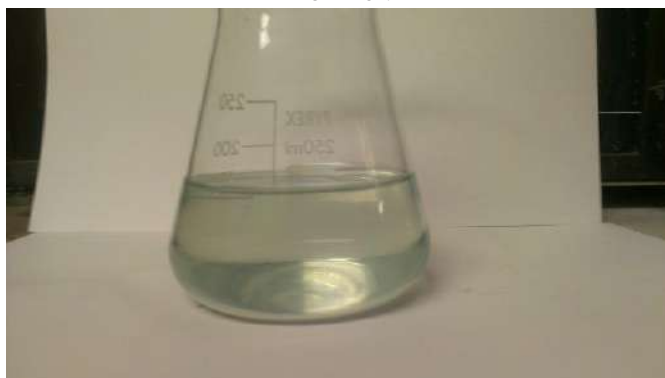
A chrome (vi) solution after the addition of potassium iodide and acid.
Note the dark colour; this is normal.



A chrome (vi) solution after the addition of the starch indicator.
Note the black colouration; this is normal.



A chrome (vi) solution after the titration with 0.1 M sodium thiosulphate.
Note the very pale green colouration; this is normal.



A typical description of a Cr (vi) titration is given below so it can be related to the pictures above.



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Titration

Measure 5 cm³ of the bath into a flask and dilute to about 100 cm³ with water.

Add approximately 1 gram of Potassium Iodide and approximately 10 cm³ of concentrated Hydrochloric Acid and agitate until dissolved.

Titrate with 0.1 M Sodium Thiosulphate to a pale straw colour, then add approximately 0.5 grams of Iodine Indicator and continue the titration until the blue-black colour just disappears.

Use of results

Once a titration has been carried out and the result recorded, it may be necessary to then use a factor to either multiply or divide the titration result by.

For example, the **Walterisation® 7460** concentration is given by:

Titration in mL of 0.1 M Sodium Thiosulphate x 1.613 =

% **Walterisation® 7460** (The 1.613 is the factor)

In this example, the **Walterisation® 7460** bath can be controlled either on the titration result alone and/or by the % concentration. Either will do, but you must be consistent!

TECHNICAL SUPPORT

Further information and recommendations, including a Plant Advisory Service, are available.

Technical training programmes are held for the training of pre-treatment personnel and managers.