

CHROMIUM (CHROMICOL)

TEST FOR SOLUBLE CHROMIUM IN NATURAL AND INDUSTRIAL WASTE WATER

Photometer Method

**AUTOMATIC
WAVELENGTH
SELECTION**

0 – 1.0 mg/l

Chromium may be present in certain industrial waste waters, such as those from the tanning, plating and coating industries. Chromium may occur in hexavalent form as chromates and dichromates, or in trivalent form as chromium salts. In water supplies hexavalent chromium is a particularly objectionable constituent. Trivalent chromium, although relatively inert, is also regarded as undesirable.

The Palintest Chromicol test provides a means of measuring chromium over the range 0 - 1.0 mg/l. The test is particularly useful since it can be used to differentiate between the concentrations of trivalent (Cr^{III}) and hexavalent (Cr^{VI}) chromium present.

Method

In the Palintest Chromicol method, hexavalent chromium salts in acidic conditions react with diphenylcarbazide to give a purple coloured complex. This provides a measure of the hexavalent chromium (Cr^{VI}) present in the sample. The reagents are provided in tablet form and the test is simply carried out by adding tablets to a sample of the water.

To determine total chromium (Cr^{III}) plus (Cr^{VI}) a fresh sample of the solution is oxidised using a powder reagent to convert the trivalent chromium to the hexavalent form. The test is then repeated to give a measure of the total soluble chromium content of the water. The difference between the two readings gives a measure of trivalent chromium

The intensity of colour produced in the tests is proportional to the chromium concentrations and is measured using a Palintest Photometer.

Reagents and Equipment

For Hexavalent Chromium :-

Palintest Chromicol No 1 Tablets

Palintest Chromicol No 2 Tablets

Palintest Automatic Wavelength Selection Photometer

Palintest Test Tubes, 10 ml glass (PT 595)

For Trivalent and Total Chromium :-

Palintest Chromicol CR Reagent (Spoon Pack)

Palintest Pretreatment Tube, 20 ml plastic (PT 526)

Filtration Kit, 0.45µm (PT 601)

Chromicol CR Reagent and the Pretreatment Tube are additional items required in the tests for total and trivalent chromium. These items are available as a supplementary pack (AT 283) for use in conjunction with standard Chromicol reagent packs (PM 281 and AP 281).

A filtration is required during the course of the procedure for total and trivalent chromium. The use of Palintest Filtration Kit (PT 601) is recommended for this purpose. Alternatively, standard laboratory equipment with Whatman 0.45µm or equivalent membrane filters may be used.

Test Procedure - Hexavalent Chromium

- 1 Fill round test tube to the 10 ml mark.
- 2 Add one Chromicol No 1 tablet, crush and mix to dissolve.
- 3 Add one Chromicol No 2 tablet, crush and mix to dissolve.
- 4 Stand for 10 minutes without disturbing the solution to allow full colour development and to enable any undissolved particles to settle.
- 5 Select Phot 55 on the Photometer.
- 6 Take photometer reading in the usual manner (see Photometer instructions). **(Result A)**.
- 7 The result represents the hexavalent chromium concentration (chromates and dichromates) as mg/l Cr. Stop the test at this stage if only hexavalent chromium determination is required.

Test Procedure - Total Chromium

- 1 Fill the pretreatment tube with sample to the 20 ml mark.
- 2 Add one level spoonful of Chromicol CR powder. Replace screw cap and shake tube well for two minutes.
- 3 Allow tube to stand for two minutes.
- 4 Filter a portion of the solution **dropwise** into a round glass test tube. Discard the first few drops and then fill to the 10 ml mark.
- 5 Add one Chromicol No 1 tablet, crush and mix to dissolve.
- 6 Add one Chromicol No 2 tablet, crush and mix to dissolve.
- 7 Stand for 10 minutes without disturbing the solution to allow full colour development and to enable any undissolved particles to settle.
- 8 Select Phot 100 on Photometer.
- 9 Take photometer reading in usual manner (see Photometer instructions).
- 10 The result represents the total soluble chromium concentration (trivalent and hexavalent) as mg/l Cr **(Result B)**.

- 11 The trivalent Chromium (Cr^{III}) concentration is obtained by subtracting Result A from Result B :-

$$\text{Trivalent Chromium} = \text{Result B} - \text{Result A}$$

Interferences

Levels of dissolved iron above 1 mg/l cause low results for chromium. To increase the tolerance, repeat the test using two Chromicol No 1 tablets and one Chromicol No 2 tablet. Tannin causes complexation which prevents a response in the test.
