

ALKALINITY M and P (ALKAPHOT M and P)

Photometer Method

**AUTOMATIC
WAVELENGTH
SELECTION**

**TESTS FOR ALKALINITY M and P IN BOILER
WATER AND OTHER INDUSTRIAL WATERS**

0 – 500 mg/L CaCO₃

The Alkalinity of water is caused by the presence of alkaline substances such as hydroxides, carbonates, bicarbonates and, to a lesser extent, silicates and phosphates. Quantitatively alkalinity is the capacity of the water to react with acid to a specified pH end point. The value obtained will depend on the pH indicator used. Two measures of alkalinity are conventionally applied - Alkaphot M (Alkalinity to methyl orange) and Alkaphot P (Alkalinity to phenolphthalein).

Alkalinity is an important test parameter in a number of industrial water uses, notably in boiler water treatment. Boilers and steam raising plant are normally operated under conditions of high alkalinity in order to minimise corrosion and the monitoring of alkalinity is an important control test.

The Palintest Alkaphot M and Alkaphot P tests provide a simple means of checking Alkalinity M and Alkalinity P levels over the range 0 - 500 mg/L CaCO₃. The tests are particularly suited to boiler and industrial waters. The alkalinities specifically due to carbonates, bicarbonates and hydroxides can be calculated from the various data obtained.

Method

The Palintest Alkaphot M and Alkaphot P tests are both based on unique colorimetric methods. These methods offer considerable advantages over the titrimetric methods traditionally used for measuring these parameters.

The tests are each based on the use of a single tablet reagent containing a precisely standardised amount of acid combined with a colour indicator. The tests are simply carried out by adding the appropriate tablet to a sample of the water under test. Over the alkalinity range of each test a distinctive series of colours is produced - from yellow through green to blue in the case of the Alkaphot M test and from colourless to purple in the case of the Alkaphot P test. The colour produced in each of the tests is indicative of the alkalinity and is measured using a Palintest Photometer.

Reagents and Equipment

Palintest Alkaphot M Tablets
Palintest Alkaphot P Tablets
Palintest Automatic Wavelength Selection Photometer
Round Test Tubes, 10 ml glass (PT 595)

Test Procedure - Alkaphot M

- 1 Filter sample if necessary to obtain a clear solution.
- 2 Fill the test tube to the 10 ml mark with sample.
- 3 Add one Alkaphot M tablet, crush and mix. Ensure all particles are dissolved.
- 4 Select Phot 37 on the Photometer.
- 5 Take Photometer reading in the usual manner.
- 6 The result is displayed as mg/L CaCO₃

Test Procedure - Alkalinity P

- 1 Filter sample if necessary to obtain a clear solution.
- 2 Fill the test tube to the 10 ml mark with sample.
- 3 Add one Alkaphot P tablet, crush and mix to dissolve.
- 4 Stand two minutes to allow complete colour development.
- 5 Select Phot 38 on the Photometer.
- 6 Take Photometer reading immediately in the usual manner.
- 7 The result is displayed as mg/L CaCO₃.

Alkalinity Relationships

From the results obtained from the foregoing procedures it is possible to classify the sample into the three main chemical forms of alkalinity present in most waters, namely hydroxides, carbonates and bicarbonates. This calculated relationship assumes the absence of other weak forms of alkalinity and also assumes that hydroxides and bicarbonates are not compatible in the same sample. The chemical forms of alkalinity, expressed as mg/L CaCO₃ are calculated by the following equations :-

- a) If Alkalinity P = 0
Then Bicarbonate = M
Carbonate = 0
Hydroxide = 0
- b) If Alkalinity P > 0 and M > 2P
Then Bicarbonate = M - 2P
Carbonate = 2P
Hydroxide = 0
- c) If Alkalinity P > 0 and M < 2P
Then Bicarbonate = 0
Carbonate = 2M - 2P
Hydroxide = 2P - M

Where P and M are the results of the Alkaphot P and Alkaphot M tests respectively.

Note

The expression of alkalinity results sometimes causes confusion. It is normal practice to express the result as mg/L CaCO₃ (calcium carbonate). This is merely a convention to allow the comparison of different results and does not necessarily indicate that the alkalinity is present in the water in this form. The different chemical forms of alkalinity have been referred to in the test instructions.
