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NOTE

Flame Photometric Determination of Traces of Sodium Content of the Sea Water Sample

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Sea water sample is collected, taking all necessary precautions like container material, depth of the sea, temperature of the sample during collection, pH and dissolved oxygen etc. and analysed in the laboratory for its sodium content. An alkali metal which gives intensely yellow colour flame when aspirated into the flame.

Key Words: Flame photometry, Determination, Sodium, Sea water.

Analysis of the different alkali metals like Na, K, Ca, Mg, Ba, Sr, Li, etc. can be analysed by the technique called flame emission spectroscopy (FES) or flame photometry.[1-4] The analysis is normally carried out for the known samples. But in this communication, the sea water is used for the analysis.

Flame photometry can also be used for the determination of certain transition elements like copper, iron and manganese.[1-4] This is a rapid method used for all the above mentioned elements which can be easily excited. Flame photometry is used for both qualitative and quantitative analysis. The intensity of the colour tells us about the amount and type of the colour about the nature of the element introduced into the flame. So an attempt is made in this communication to report the analysis pattern of sodium in the sea water.

The sea water sample is collected in the month of July 2002 and immediately pH, temperature are noted on the spot. The sample is then brought to laboratory, where it is diluted to a required extent by triply distilled water. The series of known concentrations of sodium chloride (in terms of Na) solution is prepared in ppm.

Flame photometer of Systronics is used, in which fuel-oxidant ratio can be adjusted by respective sources. Once the flame is completely produced, then solution of known concentration is aspirated or nebulised in it and meter readings are noted for both sample as well as for standard solutions.

Adjustment of the flame photometer

Fuel and oxygen are provided to the flame to produce (fuel is gas and oxygen from air compressor). Then it is allowed to stabilise for minimum 20–30 min which is called pre-heating. Then the triply distilled water is taken and aspirated through a capillary to the burner chamber which gives dark blue colour flame, and zero on galvanometer is adjusted. Then maximum concentration (60 ppm) solution is taken and 100 on galvanometer is adjusted. This is essential to minimize the instrumental error, if any. Then all other measurements are carried out.

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The flame is essentially a stream of gases or vapours heated as a result of chemical reaction, generally oxidation. The temperature of the flame can be roughly computed from the heat of combustion of the fuel, making allowance for the heat absorbed in the possible dissociation of the product molecules.

When a dilute solution of the compound under test (NaCl) is nebulised into the flame a series of events take place.

- The small droplets evaporate quickly to leave behind even smaller solid particles of the solute which ultimately fuse and evaporate into the gas phase as free atoms.
- These atoms absorb heat from the homogeneous flame produced and get excited to high energy level called excited state.
- This state is unstable, so they try to come back to their original position, *i.e.*, ground state (low energy) and achieve stability. While doing this they emit the radiant energy which is recorded as meter reading. This is the basis for flame photometric determination.

As soon as the sample reaches the flame the colour of the flame changes to golden yellow, *i.e.*, the flame test for Na metal and galvanometer shows the deflection. In this way a series of solutions are aspirated to the flame stepwise and meter readings are recorded which shows the trend as shown in the observations (Table-1). Then the sample of sea water is aspirated and reading is noted, which is also shown in Table-1 as unknown sample.

The calibration curve or standard curve is plotted (meter reading *vs.* concentration of Na in ppm), a straight line is obtained from which the concentration of unknown sample is calculated.

TABLE-1
METER READINGS

Sr.No.	Concentration of sodium (in ppm)	Meter readings
1.	10	33
2.	20	61
3.	30	66
4.	40	76
5.	50	86
6.	60	100
	Unknown sample	75

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