

duct, square the third digit, add all the three, and then add 9—142. Put 2 as the next digit in the result and carry over 14. Next multiply the second and fifth digits, double the product and add to it the doubled product of the third and fourth digits and then add 14—90. Put 0 as the next digit and carry over 9. Next multiply the third and fifth digits, double the product and add the square of the fourth digit and then add 9—85. Put 5 as the next digit and carry over 8. Next multiply the fourth and fifth digits, double the product and then add 8—56. Put 6 as the next digit in the result and carry over 5. Finally square the fifth digit, and add 5, we get 41 as the first two of the result 4165024369.

The method can be similarly applied to figures extending to any number of digits. It may be noted that the method can be worked entirely mentally. I propose to give other methods in a number of subsequent communications.

Statistical Section,
Indian Agricultural
Research Institute,
New Delhi, AZIZUDDIN AHMAD SIDDIQI.
April 21, 1947.

COLOURED LIMESTONES OF THE PALNAD AREA

SAMPLES from the limestone deposits occurring in Palnad in Guntur district exhibit an attractive variety of colours. A single piece of a few inches length taken from such samples is often found to have distinct zones which are very different from each other in colour. Two sections in juxtaposition but possessing shades of chocolate and pale green respectively are cut from the same plane of easy breakage. The relative behaviour of these two sections in the matter of certain physical properties has been studied by us.

Effective elastic constants are determined by the wedge method developed in this laboratory, and are given below along with the densities.

Colour	Density (gm./cc.)	Ultrasonic velocity (km./sec.)	Effective elastic constant (dynes/sq.cm.)
Chocolate	2.78	6.42	1.144×10^{12}
Pale green	2.69	6.52	1.147×10^{12}

The dielectric constants are determined by a liquid mixture method. The limestone section is moved between the plates of a condenser containing a liquid mixture, and the concentration of the latter is adjusted such that the introduction or withdrawal of the section does not change the capacity. Then the dielectric constant of the liquid mixture, which is equal to that of the solid section, is determined. The two sections are dried by heating at 200° C. for two hours and their dielectric constants are determined. Later, they are made to absorb different amounts of moisture, and the dielectric constants for different moisture contents

are determined. Results are given in the following table.

Moisture content in gms. per unit volume	Dielectric Constant	
	Chocolate coloured section	Pale green section
Dry	8.4 ± .1	7.8 ± .1
.0011	9.5 ± .1	
.0020 (equilibrium)	12.2 ± .1	
.0032	19 ± .5	
.0040	26 ± 1	
.0006 (equilibrium)		10.6 ± .1
.0014		15 ± .5

The two sections were dipped in water for half an hour, taken out, and their surfaces were wiped well. It was found that their moisture contents were first high but gradually decreased and attained equilibrium values in a day. The equilibrium moisture content for the chocolate-coloured section is .0020 gm./c.c. at which the dielectric constant is 12.2. The corresponding moisture content for the pale green section is .0006 gm./c.c., dielectric constant being 10.6.

Thus we see that the elastic constants of the two sections are the same and their dielectric constants are very near each other in the dry condition. The effect of moisture is different in the two cases. The two sections can retain quite different amounts of moisture in equilibrium. Further, for the same moisture content, the dielectric constant of the pale green section changes more than that of the chocolate-coloured section. It is suggested that the differences in colour have something to do with the probable differences in the particle size, the latter property also manifesting itself in the absorption and retention of different amounts of moisture.

The authors are grateful to Professor S. Bhagavantam for his kind interest in the work.

D. A. A. S. NARAYANA RAO.
G. H. S. V. PRASADA RAO.

Andhra University,
Physics & Geology Departments,
May 8, 1947.

ESTIMATION OF TOTAL CHLORINE IN BLEACHING POWDER

THE method that was being followed in this laboratory for estimating total chlorine in bleaching powder was as follows:—

- (1) Reduce an aqueous suspension of the bleach with hydrogen peroxide and estimate total chlorines by Volhard's method.
- (2) Reduce an aqueous suspension of the bleach with the exact quantity of arsenite required as determined in the usual manner for estimation of available chlorine; add 20 c.c. conc. HCl and distil into 10% KI. Titrate the

iodine solution which gives the equivalent of chlorate.

Total chlorine was obtained by adding the two chlorine equivalents.

This method involving three determinations (i.e., including the determination of available chlorine) and a distillation, was considered cumbersome, and the following was tried as an alternative.

0.3 to 0.4 gm. of the sample is mixed with ten times its weight of anhydrous sodium carbonate previously dried at 150° C. and placed in a platinum crucible. The mixture is covered with a layer of 5 gms. of anhydrous sodium carbonate. The crucible is gently heated on a pipe-clay triangle and raised to dull-red heat in not less than fifteen minutes, and kept at this temperature for 10 minutes. It is then cooled, placed in a covered beaker, the contents tipped out and dissolved in dilute nitric acid. Any salt left in the crucible is also similarly dissolved, the crucible removed by means of a pair of platinum-tipped tongs, and rinsed inside and outside with water into the beaker. The chloride in the solution is then estimated by Volhard's method.

In order to find out if any chlorine was lost during heating in the process, a short half-inch silica tube was packed successively with 5 gms. of anhydrous sodium carbonate, bleaching powder mixed with ten times its weight of anhydrous sodium carbonate, and another 5 gms. of sodium carbonate. A current of air freed from CO₂ and moisture was drawn slowly through the packing by means of a filter pump into a U-tube containing 10% KI solution containing starch as indicator. The portion containing bleaching powder was heated gently at first and then raised to red heat. There was no colouration of the iodide solution in 20 minutes. 0.3 gm. and 0.6 gm. of bleaching powder were also heated with negative results.

It is essential that the heating should be done gently at first and that the sodium carbonate should be anhydrous. The following table shows that the new method while quick and elegant gives figures that agree closely with those obtained by separate determinations of the various constituents of bleaching powder.

Serial No.	By Method (1)	Total chlorine By fusion with Na ₂ CO ₃
1	33.36	33.33
2	33.41	33.34
3	33.41	33.40
4	33.41	33.25
5	33.41	33.32
6	33.41	33.28

Our thanks are due to the Controller of Armament Development for permission to publish this note.

Inspectorate of Military Explosives,

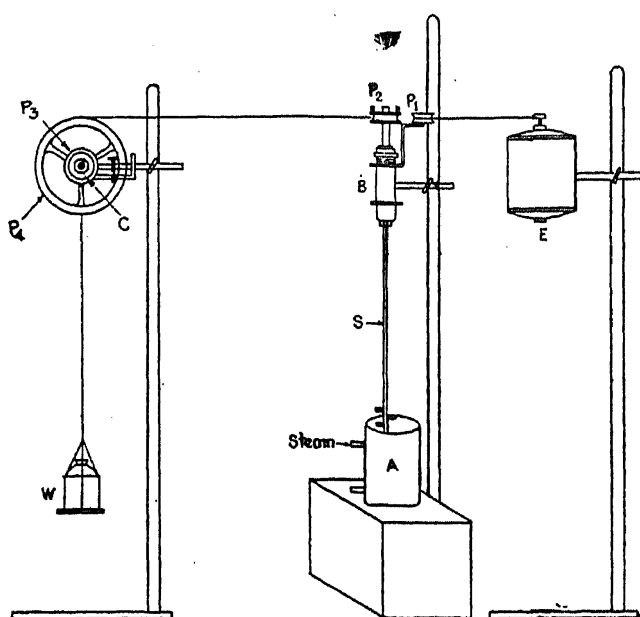
Kirkee,
April 28, 1947.

C. D. LAFFERTY.
K. S. VARADACHAR.

VISCOMETER FOR HETEROGENEOUS MIXTURES

THE usual kinematic type of viscometer is obviously unsuitable for heterogeneous mixtures in which a solid phase is uniformly distributed in a liquid phase, as for instance T.N.T. and ammonium nitrate over 80° C. For measuring the viscosity of such a mixture a simple apparatus is described here.

The principle on which the instrument is worked is the measurement of the time taken by a paddle to complete a definite number of revolutions under the force of falling weight, or alternatively the weight required to turn the paddle at a given speed.



VISCOMETER.

The apparatus shown above consists of :—

1. A—Steam-jacketed aluminium can of 600 c.c. capacity.

2. S—Aluminium stirrer.

3. Gear System :

B—Bicycle hub, carrying the stirrer below and a mounting above, on which a detachable pulley can be quickly slipped on.

P₁ and P₂—Two detachable pulleys either of which can be taken on B. P₁ is operated by an electric motor during the preliminary process of stirring the material under test. P₂ is operated by the falling weight of the material under test during the measurement of consistency.

C—Bicycle hub.

P₃—Pulley attached to C, carrying the falling weight.

P₄—Larger pulley, coaxial with P₃ to unwind a thread from P₂, thereby causing P₂ to rotate.

4. W—Moving weight.