

2—This method has been found to be rapid, accurate, and highly satisfactory with chrome iron ores, and should adapt itself for use in control work, in the analysis of such ores.

### A RAPID VOLUMETRIC METHOD FOR DETERMINING ALCOHOL

By Arthur Lachman

143 FOURTEENTH AVENUE, SAN FRANCISCO, CALIFORNIA

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The accurate estimation of alcohol by means of the density of water-alcohol mixtures requires great care, especially in regard to temperature control. The tables of the Bureau of Standards are carried out to five figures, with alcohol values in terms of hundredths of per cents; but such accuracy requires a temperature adjustment of about 0.01°. Atmospheric changes may introduce fluctuations of more than 0.15 per cent, involving reduction of weights to vacuum. The tables of the Bureau have been compiled with all possible care, as have those of the German *Normal-Aichungs-Amt*; yet these two tables differ in parts by as much as 0.10 per cent, or more than ten times the limit of accuracy postulated in the tables themselves.

The method herein briefly described gives a high degree of accuracy, and is exceedingly rapid. It is based on the determination of the critical point of an equilibrium of the third order. A fixed weight of aniline (25.00 g.) is pipetted into a definite volume (50.00 cc.) of the alcohol-water mixture whose strength is to be determined. If the aniline does not dissolve completely, some convenient fixed volume, such as 25.00 cc. of strong alcohol of known strength, is added until solution occurs. Water is run into the clear solution from a buret until a permanent turbidity occurs. The end-point is exceedingly sharp; a single drop of water converts the perfectly clear, or slightly opalescent, liquid into a milky suspension that cannot possibly be mistaken. If the end-point is overshot, the vessel is slightly warmed in the hand, and a drop or two of water added again. When the end-point is reached, the temperature of the mixture is noted to 0.1° C. The operation is then complete, requiring merely 2 or 3 min. From the known volume of sample, of added alcohol, and of added water, the percentage of alcohol in the sample can be calculated. The following tabulation shows the character of the results obtained:

Determined by—		Determined by—	
Density	Titration	Density	Titration
20.10	20.04	32.54	32.57
	20.02		32.58
	20.04		
22.94	22.91	50.63	50.60
	22.95		50.59
	22.91		50.62
			50.66
23.76	23.72	96.03	96.04
	23.76		96.07
	23.82		96.08
	23.76		96.07
	23.78		
25.15	25.12	99.84	99.86
	25.12		99.83

The calculation depends upon the experimentally established fact that the total volume of solvent (alcohol plus water) is a nearly strictly linear function

of the volume of contained alcohol. If a number of points on the curve are determined, the intermediate values may be obtained by graphic interpolation without serious error. In the following condensed table are given the total solvent volume and the corresponding alcohol volumes. By deducting the known volume of added alcohol, we find the volume of alcohol in the sample:

#### RELATION BETWEEN TOTAL VOLUME OF SOLVENT AND VOLUME OF CONTAINED ALCOHOL

(For 25.00 G. Aniline at 15.6° C.)

Total Solvent	Alcohol	Total Solvent	Alcohol
50	22.28	100	37.41
60	25.38	110	40.30
70	28.40	120	43.05
80	31.43	130	45.80
90	34.42	140	48.50
..	...	146	50.00

Several corrections must be made before the final result is obtained. Tables for these have been calculated, but owing to lack of space they cannot be given here, and a brief enumeration must suffice.

The total solvent volume given above holds only for the normal alcohol temperature of 15.6°. The temperature coefficient happens to be almost exactly 1 per cent of the total solvent volume per degree, for a range of 2° or 3° in both directions. The temperature during titration may be kept close to the normal by immersing the flask occasionally in cold water.

The temperature of the sample and of the added alcohol may be kept between 14° and 17° without appreciable effect upon the results; larger deviations require correction. The volume of water added from the buret may require correction if the room temperature differs by more than 5° from normal.

The most troublesome correction is caused by the contraction of volume which has previously taken place in the sample. It may be ascertained by making an approximation value, then computing the contraction, and recalculating. Tables have been worked out for this correction, but cannot be given here.

The above method has been used in commercial control work over a period of nearly 10 yrs. Where routine work is done over a comparatively limited range of strength, it is possible to condense all calculations into one set of tables, and to obtain percentages of alcohol directly from the buret readings.

The anti-trust suit of the Federal Government against the Eastman Kodak Company was settled February 1, 1921, with the filing of a decree in the U. S. District Court in Buffalo, requiring the company to dispose of approximately \$4,000,000 of its assets, which total \$90,000,000. Among other things the decree orders the sale of the Premo factory and the Century-Folmer and Schwing factory in Rochester and the Aristo plant in Jamestown, N. Y., plants which were acquired from competitors, and not developed as part of the industry built up by George Eastman. It is stated that the decree will result in no substantial disruption of the organization, since a radical move for dissolution has practically been stopped, and the company will carry on its activities with renewed confidence. Notice of appeal was withdrawn after a conference of the company's representative with the Attorney General in Washington.