

V. Action of citric acid on slag.

Amount of acid neutralized in times ranging from one-half to five hours, at 25° C and at 65° C. Amount of phosphoric acid remaining in solution at the end of these periods. The phosphoric acid in solution decreases with a rise in temperature and with an increase in time.

VI. Comparison of the U. S. official method with the method proposed by Dr. Paul Wagner, including special molybdate and magnesia solutions.

The paper will be found in complete form in Bul. 49, Chem. Div. U. S. Dept. Agr., p. 68-72.

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THE CHARACTER OF THE VOLATILE MATTER LOST BY BITUMINOUS COALS AT 100° C. BY W. E. BURK.

The conditions accompanying the common method of determining moisture in coal suggested a study of the nature and amount of volatile matter given off at the temperature of determination.

The work was done on two classes of Indiana coals, one high in moisture, the other considerably lower, the operation consisting in passing the volatile products from the coal heated approximately to 100° C, together with a current of dry air over copper oxide in a combustion furnace, absorbing the moisture coming over with calcium chloride, and carbon dioxide arising from combustion of any volatile hydrocarbons in a caustic potash solution.

A hard glass combustion tube was used, which extended some 20 c. m. from the forward end of the furnace. This portion of the tube was jacketed with a glass sleeve with rubber plugs, and arranged with entrance and exit openings through which a continuous current of steam was passed. By this means a temperature approximating 100° C was maintained through the forward part of the tube in which a weighed quantity of powdered coal was placed in an aluminum boat. A slow current of dry air was passed, and the heating of coal and combustion of volatile products maintained for one hour. The boat was then removed and the absorption bulbs weighed, after which they were attached again and the tube heated for a further twenty to thirty minutes. The boat containing coal was weighed in a glass enclosing tube, and after the operation was allowed to cool in

same tube and under similar conditions, thereby preventing any reabsorption of moisture while cooling.

Determinations were made on from one to three grams of coal, giving results of which the following are fair examples:

WEIGHT OF COAL TAKEN.	Loss in Weight of Coal at 100° C.	Gain in Weight of Each Tube.	Moisture.	Carbon Found From KOH Absorption.
1.4217 gr.	.1994	.2014	14.00%	.048%
1.1195 "	.1596	.1625	14.25%	.058%
3.1079 "	.2111	.2113	6.78%	.022%
3.2356 "	.2152	.2142	6.65%	.025%
2.9408 "	.1967	.1967	6.65%	.037%

The gain in weight of the calcium chloride tube corresponds with a slight difference to the loss in weight of the coal, giving per cent. of moisture, which agreed very well with separate determination of moisture in the same coals by the ordinary method of heating for one hour in a toluene bath, results being slightly higher, due perhaps to current of air passing over coal, removing moisture more completely.

The gain in weight of the calcium chloride tube exceeded the loss in weight of the coal more than what would arise from the combustion of any volatile hydrocarbons present, as indicated by carbon found and calculated as methane. This excess of water found may indicate presence of free hydrogen, but a correct explanation of its presence, as well as of the source of carbon found, can not be made without an accompanying analysis of the gases given off from the coal at 100° C, as the small percentage of carbonic oxide, carbon dioxide and hydrocarbon volatilized at 100° varies widely with different coals. The per cent. of volatile hydrocarbons given off in these experiments —.029% to .077%—calculating as methane, is probably higher than occurs in the regular determination of moisture because of the air current, while on the other hand the somewhat lower temperature of these experiments would tend to modify the difference. As in no case, however, does the loss of volatile matter other than water nearly reach one-tenth of one per cent., the error in calculating the same as moisture is of no practical importance.