

## CHALK ROCK INVESTIGATIONS

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In 1931 a preliminary report on the chalk rock of South Dakota by Dr. E. P. Rothrock was published by the State Geological Survey, which called attention to its possible commercial value. The suggestion that the present work be started was offered a year or so ago by Dr. Rothrock, but was only made possible when the FERA funds became available. Most of the work was done by Mr. Ward, and is on the basis of carbon dioxide analysis, as the man assigned to the mineral analyses did not produce sufficient results to be worth publishing. Although very little progress has been made, it seemed best to make a report at this time because if the FERA is discontinued, it will be some time before the work can be continued.

The sample was taken from the quarry of the old cement plant west of Yankton. Some of the darkest rock available was taken, and was dark gray in color, gradually lightening as it dried and weathered in the laboratory, although never, even after grinding, becoming pure white. This was ground to 100 mesh and dried. A qualitative analysis disclosed nothing besides organic matter and the ordinary elements to be expected in limestone. The analyses for carbon dioxide were made under three conditions, in each case absorbing the carbon dioxide in ascarite; (1) After dissolving in hydrochloric acid<sup>1</sup>, (2) After dissolving in chromic acid<sup>2</sup>, to include and organic carbon, (3) a repetition of (1) after an attempt to increase by washing the percentage of calcium carbonate. These results, as well as a mineral analysis for calcium oxide<sup>3</sup>, are included in Table I. The calculated calcium carbonate is between the 75.6 and 92.7 percent given for two limestones from this quarry in the geological survey report, and agrees with the 84.3 given as the average for Yankton chalk. The increase in carbon dioxide found under the wet combustion method would

1 Elementary Quantitative Analysis, Willard and Furman, D. Van Nostrand Co., (1933), pp. 332-6.

2 Treadwell-Hall, Analytical Chemistry 5th Ed. 399-402.

3 Willard and Furman pp. 167-9.

seem to indicate that part at least of the impurities is due to organic matter.

Table I

	Percentage of carbon dioxide		Average		Ave. calcd. to calcium carbonate
(1) Diss'd in HCL	37.53	38.02	37.49	37.68	85.70
(2) Chromic acid	53.49	51.42		52.45	
(3) After washing	38.38	40.03		39.20	89.16
(4) Mineral percent					
CaO	48.03	48.29		48.16	85.95

The washing was done in the following manner. A simple elutriator was made by so connecting three glass tubes of increasing diameter that a current of water would flow upwards in each. The water was then led to the bottom of a 2-liter beaker, overflowing from this to the sink. The charge was shaken with water in a test tube until thoroughly wetted and placed in the first (smallest) tube, the apparatus filled with water, and the flow started. The water velocity was kept such that the last overflow was practically clear. After washing three to four hours the flow was stopped, and the suspended material allowed to settle. The hird analysis in Table I is that of the material from the beaker. In spite of the lack of agreement in these results, the fact that the lower of the two analyses in (3) is higher than the highest of those in (1), would seem to indicate that an improvement in the calcium carbonate content was achieved. This is borne out by the fact that there is a slight but easily distinguishable lightening in color from the original toward this fraction, and darkening toward the heavier fraction. The fact that the dark part is the heavier would seem to indicate that something besides organic matter, perhaps iron, was involved.

Any further work done will be an attempt to determine more definitely the nature of the impurities, and to investigate further possibilities of purification.