

burning of 250 tons of uranium and thorium and world requirements might by then be of the order of 2,000 or 3,000 tons. Known reserves of uranium already total well over 1,000,000 tons and the cost per lb. of metal has been predicted to be as low as £4 by the end of the next decade. The intensive prospecting of the past few years has proved that world resources of uranium are very large indeed and although some nations are already committed to nuclear power programmes in which uranium is the fuel, as alternative fuels become more important the mining of uranium is likely to contract and ultimately to centre on the higher-grade deposits. With further development the uranium-fuelled generator may become more economic in operation, but it is abundantly clear that the prospects of fuel breeding reactors are more attractive at the present

stage. The demand for thorium for these reactors is of importance to the mining industry, but the days of this fuel seem already to be numbered.

The Geneva Conference did little more than hint at the possibilities of power generating utilizing a thermonuclear reaction similar to that which takes place in the hydrogen bomb. All reactors at present under construction are fission plants, but the fusion reactor is said to offer advantages both in economy and ease of operation.

Of the raw materials which could be used in the fission process lithium seems to be the most promising at present and research into its use as a nuclear fuel is in progress. Production of lithium ores may well become the mining industry's main participation in the Atomic Age.

Magnesia in Limestone

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Abstract

A field test for classifying limestones according to their magnesia content is described, together with a simple and rapid semi-quantitative method of determining magnesia in powdered limestone samples.

Introduction

The limestones in a certain quarry in the United Kingdom vary considerably in their magnesia content, but are otherwise reasonably uniformly low in contaminating substances. The magnesium minerals occurring there are dolomite and magnesite. Recently the writer was asked to develop a simple technique by means of which some indication of the magnesia content in any hand-specimen from this quarry could be quickly obtained. He was also asked to find a simple and rapid substitute for the reliable, but slow, "Phosphate Method".

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Field Test

The following test—which can be conducted in a few seconds at the quarry face—was found by checking against samples of known compositions to be a satisfactory way of classifying hand-specimens with respect to their magnesia content:—

A drop of 0.1% Titan Yellow is added to a streak of the sample on a small portion of well-vitrified unglazed floor-tile. When the reagent has sunk into the tile a drop of 5N sodium hydroxide is added. According to whether the magnesia content is high, moderate, or low, the colour of the treated streak is vermilion, orange, or yellow.

Semi-Quantitative Determination

As the object of conducting magnesium assays at the quarry is to enable blending operations to be controlled and to ensure that the final product contains not more than a stipulated percentage of magnesia, an analytical method capable of yielding highly

accurate results is unnecessary. Consequently, as the streak test was successful in giving some information of the variation in magnesia content of the rocks of the quarry, it was thought that the same reagents might be used as the basis of an assay which would be sufficiently accurate for control purposes.

To test this, a series of assayed samples, varying in magnesia content from 0.25% to 8%, were ground to *minus* 200 mesh. A standard volume (about 4 ml.) was taken from each sample by utilizing a spoon-type spatula and removing a level spoonful of the powder. Each portion was treated separately by placing it in a 4 in. diameter deep porcelain mortar, together with 5 ml. of 0.1% Titan Yellow. The mixture was ground for 1 min. and then 5 ml. of 5N. sodium hydroxide were added and grinding was continued for a further 2 min. The entire contents of the mortar were then transferred to a large watch-glass and the solid fraction was allowed to settle. When the treated samples were arranged in a line in order of increasing magnesia content they displayed a series of colours ranging from yellow-orange through distinct orange to pink. The variation in colour between one sample and the next became more apparent with time and was most marked after about 2 hours.

To determine the magnesia content in one

or more samples a standard series was prepared in the manner described and the unknowns were similarly treated. After 2 hours the colour of each unknown was compared with the standards. Over the working range of 0.25%–8.0% magnesia the results obtained agreed closely with those given by standard chemical methods.

Conclusion

It is probable that most limestones could be evaluated with respect to their magnesia content by employing the above methods as the Titan Yellow reaction is intensified by calcium (and barium), whilst the ions which interfere—tin, arsenic, bismuth, manganese, and aluminium—are normally for all practical purposes absent, or in minerals which are unreactive under the conditions of the test. For further information about this reaction, which was due to Kolthoff, see the B.D.H. "Book of Organic Reagents." 1948, pp. 161–2.

Doubtless the approximate percentage of magnesia in a dolomite and/or magnesite-rich sample of powdered limestone could be obtained by assaying a weighed portion of it—in the manner described earlier—after sufficient pure calcium carbonate had been added to give a mixture containing from about 3% to 7% magnesia.

Uranium Mining on the Colorado Plateau¹

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Notes from an introductory
survey of conditions in the
area prepared by the
United States Bureau of Mines.

Introduction

The Colorado Plateau covers an area of over 100,000 sq. miles and is roughly centred around the common corner of Arizona, Colorado, New Mexico, and Utah. The whole plateau is an area of high elevation, ranging in most parts from 5,000 to 11,000 ft. above sea-level. It consists of many smaller individually cliff-bordered plateaux and mesas, highly-dissected canyon lands, sage-covered plains, and large expanses of desert.

It is marked by a number of laccolithic mountains and volcanic cones and plugs, which rise as high as 13,000 ft. The Plateau is characterized by more or less horizontally-bedded sediments, in contrast to the mountain masses of tilted sediments and igneous rocks on the west, east, and south.

Climatic variations are great owing to the extensive size and extreme relief of the plateau. Summers are hot in the lower altitudes and pleasant in the higher areas. Freezing temperatures are common in the winter and periods of severe cold weather may be long. The climate is arid to semi-

¹ Abstracted from the U.S. Bureau of Mines Information Circular 7726.