Reports

Significance of Diaspore at Magnet Cove, Arkansas

Abstract. The Magnet Cove magmas developed essentially monometallic phases during the later stages of crystallization. The finding of diaspore indicates that an aluminum-rich phase was present. Barium- and titanium-rich phases have already been reported.

The Magnet Cove alkalic intrusive masses near Hot Springs, Arkansas, have been collecting grounds for unusual rocks and minerals for over 150 years. The only published comprehensive study of these igneous rocks is the report of Williams (*1*). Several reports have been written about certain features of the cove complex (*2*), but no outstanding additions to Williams' work were made until data became available from a detailed study initiated by the U.S. Geological Survey in 1952. A rock-distribution map (*3*) has been published, but a wealth of geochemical (*4*) and petrographic data must be assimilated before a complete report is released.

The U.S. Geological Survey, through cooperative agreement with the Arkansas Geological and Conservation Commission, allowed the use of geochemical data which pertained to a study of the origin of the barite ($BaSO_4$) in the Ouachita Mountain area (*5*). One of the contributive discoveries was that the feldspars of some rock types within the cove complex were saturated ionically with barium. The fact that these rocks are also supersaturated with titanium is well documented (*2*).

Diaspore was found on a joint face of a quartzite bed in the lower part of the Stanley formation about 80 feet above the channel of Stone Quarry Creek in the southeast quarter of section 29, T. 3 S., R. 17 W. The nearest exposure of igneous rock is upslope 180 feet to the north. The diaspore occurs as small scattered grains on subhedral quartz. Patches of yellow- to light-brown hydrous iron oxides are associated with the diaspore.

Against the quartz background the highly lustrous diaspore grains appear to be black and closely resemble the brookite (TiO_2) on the northeast rim of the cove. However, under the hand lens and microscope the diaspore grains are blue and translucent. Except for the rather deep blue color, the physical properties are in excellent agreement with published descriptions. The optical properties vary somewhat from published data, but x-ray diffraction patterns made by R. F. Kruh at the University of Arkansas confirmed the diaspore identification. The deep blue color and slightly anomalous optics are caused, at least in part, by spectrographically detectable quantities of titanium in the diaspore.

The available evidence indicates that the fluids from which the diaspore was deposited escaped from the intrusive body along joints in the country rock. The titanium in the diaspore was expected because all the late-stage rock and mineral aggregates, including the barite, of the cove complex contain appreciable amounts of titanium. The subhedral quartz associated with the diaspore shows preferred growth direction along the joint face. This indicates that the egressing fluids flowed long enough and were of sufficiently high temperature to cause selective recrystallization and growth of the formless quartz grains of the quartzite. The diaspore is concentrated on the sides away from the intrusives of the larger quartz grain aggregates. The iron oxides were the last to form and are attached to both the quartz and diaspore. The egress of the aluminum-bearing fluids, like that of the barium-bearing and titanium-bearing fluids from which the barite and brookite were deposited, was through fractures and joints in the country rock. These deposits were formed from concentrations developed in the later stages of crystallization of the Magnet Cove magmas (*2, 5*).

The igneous rocks of Magnet Cove are chiefly medium- and coarse-grained nepheline syenites and fine-grained or aphanitic syenite equivalents. The syenitic rocks are cut by mafic (Mg-Fe rich) dikes. The granites are oversaturated with silica and therefore contain quartz, the syenites are saturated, and the silica is bound in the feldspars; the nepheline syenites are silica-deficient. In silica-deficient systems aluminum excesses are ordinary and aluminum oxides, mostly corundum (ruby, sapphire), are characteristic in the mineral assemblages.

The discovery of diaspore shows that the crystallizing Magnet Cove magmas in some phases did have an excess of aluminum. The aluminum-bearing fluids escaped through the fractured wall rock. There may have been much more diaspore formed than was found, but the possible host rocks have been removed by the erosion activity of Stone Quarry Creek. The minor amount of diaspore on the joint face is the only known trace of the aluminum-bearing fluids.

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References

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2. K. K. Landes, *Am. Mineralogist* 16, 313 (1931); C. S. Ross, *U.S. Geol. Survey Profess. Paper* 198 (1941); D. F. Holbrook, *Arkansas Geol. and Conserv. Comm. Bull. 11* (1947); V. C. Fryklund and D. F. Holbrook, *Arkansas Geol. and Conserv. Comm. Bull. 16* (1950).
3. R. L. Erickson and L. V. Blade, *U.S. Geol. Survey Mineral Invest. Map MF53* (1956).
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Instructions for preparing reports. Begin the report with an abstract of from 45 to 55 words. The abstract should *not* repeat phrases employed in the title. It should work with the title to give the reader a summary of the results presented in the report proper. (Since this requirement has only recently gone into effect, not all reports that are now being published as yet observe it.)

Type manuscripts double-spaced and submit one ribbon copy and one carbon copy.

Limit the report proper to the equivalent of 1200 words. This space includes that occupied by illustrative material as well as by the references and notes.

Limit illustrative material to *one* 2-column figure (that is, a figure whose width equals two columns of text) or to *one* 2-column table or to *two* 1-column illustrations, which may consist of two figures or two tables or one of each.

For further details see "Suggestions to Contributors" [*Science* 125, 16 (1957)].

Tryptophan Loading and Excretion of 5-Hydroxyindoleacetic Acid in Normal and Schizophrenic Subjects

Abstract. In contrast to the findings of Zeller *et al.* (*1*), schizophrenic patients did not differ from normal control subjects in the rate of 5-hydroxyindoleacetic acid (5-HIAA) excretion either before or after oral administration of L-tryptophan. The excretion of 5-HIAA may be directly related to dietary tryptophan since feeding-problem schizophrenic patients excreted less 5-HIAA than either of the well-fed groups. This was not related to pyridoxin deficiency.

The suggestion by Woolley and Shaw (*2*) that an abnormal metabolism of serotonin may be of etiological importance in mental disease has inspired many attempts to demonstrate abnormalities in the metabolism of this com-