

## AUTHIGENIC TOURMALINE IN THE ORISKANY SANDSTONE

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During the course of a detailed petrographic investigation of the Oriskany Sandstone of Virginia, West Virginia, Maryland, Pennsylvania, and New York, well rounded detrital grains of tourmaline with a jagged secondary growth were discovered. Careful microscopic examination has proved this secondary material to be authigenic tourmaline.

The growth in question is nearly colorless, but usually has a slight tinge of the same color as the parent grain. The secondary portion of the grain has parallel crystallographic orientation with the tourmaline to which it is attached, as evidenced by simultaneous extinction and identical position of maximum absorption. On one

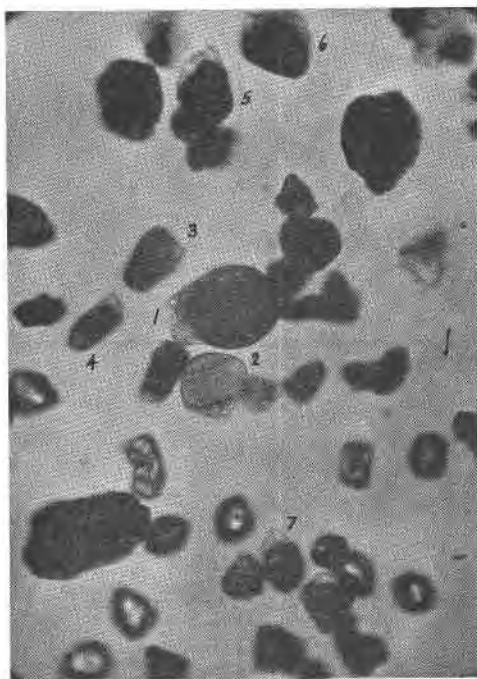


FIG. 1. Authigenic Tourmaline on Detrital Tourmaline (numbered grains), Zircon (other non-opaque grains), and Limonite (irregular opaque grains). Arrow Indicates Vibration Direction in Lower Nicol. Magnification 42  $\times$ . From Warm Springs, Virginia.

fragment a negative uniaxial interference figure was obtained.

The appearance and abundance of the enlarged grains are shown in the accompanying photographs of a part of the heavy separate of a specimen from Warm Springs, Virginia. In figure 1 not less than seven secondarily enlarged tourmalines may be seen. The exposure was taken with a magnification of 42 diameters and with only one nicol prism. Zircons and irregular lumps of limonite may also be recognized. Figure 2 shows the two central grains of figure

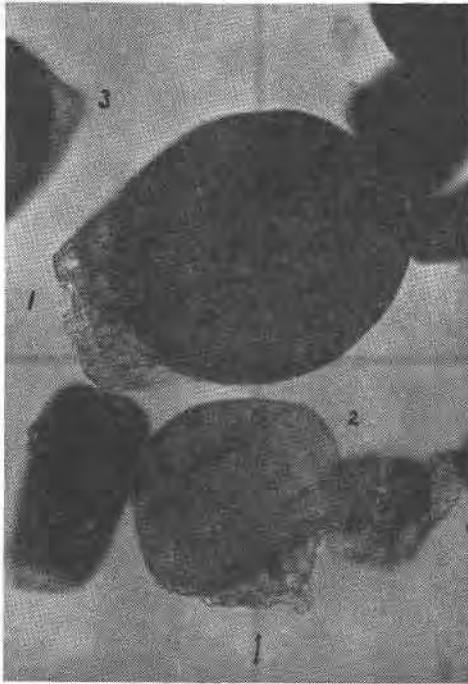


FIG. 2. Center of Fig. 1. Magnified 134  $\times$ .

1 magnified 134 diameters. In it there appears very clearly the character of the secondary material and the sharp boundary between it and the well rounded, darker colored, detrital grain. In the larger of these two grains, the "c" crystallographic axis is parallel to the elongation of the grain, and in the smaller it is at right angles to it. However, in each case the secondary material is attached at the end of the "c" axis regardless of the elongation. Furthermore, the secondary material is on only one end, or side,

of the grain. This is true, without exception, of all the grains on which this growth was observed, raising interesting speculation as to the possible connection between the polarity of tourmaline structure and its enlargement.

When these grains were first found it was thought that the secondary material was formed under local conditions at that particular place. However, as the study of the slides progressed it became evident that these occurred at so many localities throughout the entire area that purely local conditions could not be assigned for their origin. The splintery character is certain evidence that it could not have been attached to the original tourmaline grains before transportation as it would necessarily have been broken off. It must have grown after the original grains had come to rest.

The authigenic tourmaline shown in the photomicrographs is typical of that found throughout the Oriskany. It was seen in seventy-four of one hundred and sixteen heavy mineral slides, representing thirty of the seventy localities studied. Following is a list of the localities at which this unusual tourmaline was found in the Oriskany.

Virginia: Monterey, Pinckney, Wilsonville, Cleeks Mills, Warm Springs, Bath Alum Springs, Millboro Springs, Goshen, Strait-creek, Stack Mines. West Virginia: Franklin, Smoke Hole, Sweet Springs, Gap Mills, Ridgeley, Berkeley Springs, Capon Bridge, Hanging Rock Gap. Maryland: Tonoloway Ridge. Pennsylvania: Experiment Mills, Lewistown, Mill Creek, Huntingdon, Everett, Hyndman, Warren Point. New York: Union Springs, Aurelius, Skaneateles Falls, Oriskany Falls.

Just what light this secondary growth of tourmaline may throw on the physical and chemical conditions which have existed in the Oriskany formation is not yet clear. At this time no attempt has been made to study the phenomenon in detail and no explanation of its origin is attempted.

The only other occurrence of authigenic tourmaline of which the writer is aware is described in an article by H. Wichman<sup>1</sup> who bases his conclusion that the tourmaline is authigenic on the fact that it is found in very perfect crystals. This is in marked contrast with the splintery development of the tourmaline growths in the Oriskany.

<sup>1</sup> Wichman, H., Tourmaline as an Authigenic Constituent of Sands; *Neues Jahrb.*, II, pp. 294-297, 1888.