THE AMERICAN MINERALOGIST

JOURNAL OF THE MINERALOGICAL SOCIETY OF AMERICA

VOL. 10 MAY, 1925 No. 5

NOTE ON A CALCIFIED LOG FROM THE PITTSBURGH COAL, NEAR MORGANTOWN, WEST VIRGINIA

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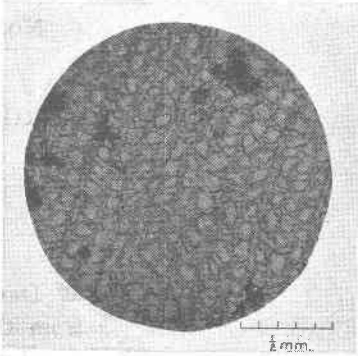
During the summer of 1923, through the courtesy of W. W. Dartnell, the writer obtained a portion of a calcified log from the Pittsburgh Coal near Morgantown, West Virginia, which is unique on account of the extent to which the cell structures of the original wood have been retained. The specimen was found in the upper portion of the coal bed in Mine No. 1 of the Connellsville Byproduct Coal Company at Barker, West Virginia. The log had been flattened before petrifaction set in so that instead of being circular it is now roughly lenticular in cross-section. The part collected, which is 21 inches long, represents only a portion of the log. At the broken end it has a maximum diameter of 11 inches and a minimum of 4 inches. At the opposite end, it tapers to a blunt wedge. No data was obtained in regard to its true length as preserved in the coal. During a brief visit to the locality from which the specimen came, several other logs, similar to the one referred to above, were seen in place in the coal at various levels. They were all in a horizontal position with their flattened surfaces parallel to the bedding of the coal.

It was not until later on, however, after thin sections of the original specimen had been prepared and examined under the microscope, that the true scientific value of the occurrence was realized. A macroscopic inspection gave no hint of the remarkable manner in which the cell structure of the original wood has been preserved. Fig. 1 represents a considerably magnified photomicrograph of a transverse section. The light colored substance consists of dolomitic calcite while the occasional black patches are pyrite. Under crossed nicols, it is found that the interior portions of the tracheid cells are often filled by a single grain of calcite or, at the most, two or three, while the walls and the space between adjacent cells consist of cryptocrystalline calcite.



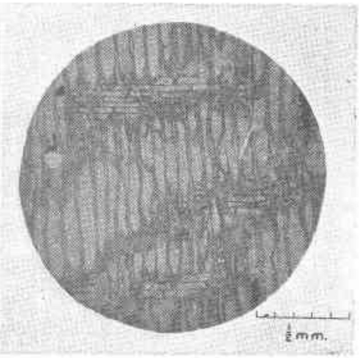


Figure 1. Photomicrograph of transverse section of calcified log from Pittsburgh Coal.

Figure 2. Photomicrograph of radial section.

Amongst the minute grains of cryptocrystalline calcite replacing the walls, a rich brown-colored substance, undoubtedly representing carbonaceous matter derived from the original wood, is present and makes the outlines of the cells stand out. When viewed in a larger field the pyrite is seen to occur along bands parallel to radii and occasionally at right angles to them. It has evidently been introduced later than the calcite and has in part replaced the latter.

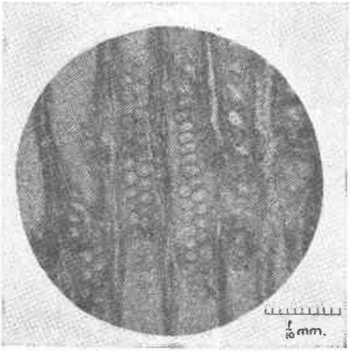


Figure 3. Photomicrograph of bordered pits along tracheids in radial section.

In the photomicrograph of a radial section, shown in Fig. 2, taken under the same magnification as Fig. 1, medullary rays and tracheids appear, along some of the latter of which bordered pits can be seen. Fig. 3 shows some of these bordered pits at a much higher magnification. Between crossed nicols relatively coarse calcite is seen to fill the interiors of the tracheids and medullary rays while cryptocrystalline calcite replaces the walls and the space between adjacent cells. Two, three, and sometimes more thin streaks of rich brown carbonaceous material form the outlines of the tracheids while a single streak usually occurs between adjacent rows of medullary rays. The pyrite appears in bands parallel to the tracheids, being occasionally confined entirely to their interiors. The greatest amount of pyrite occurs along narrow crushed zones where the wood structure has been destroyed. Here it is sometimes cut by still later veinlets of calcite. In tangential sections, cross-sections of the medullary rays may be observed as well as bordered pits leading from one tracheid to another.

A quantitative analysis of a representative fragment of the log which had a specific gravity of 2.962 gave the following results:

SiO_2	0.07 per cent
Al_2O_3	trace
Fe_2O_3	0.17
MgO	4.32
CaO	37.18
H_2O+	0.53
H_2O-	0.15
CO_2	33.89
FeS_2	22.24
C	0.88
	99.43

When this is recast into the compounds present, it shows the following percentages of the various constituents:

Dolomitic calcite		75.39 per cent
Calcium carbonate	66.35	
Magnesium carbonate	9.04	
Pyrite		22.24
Limonite		0.20
Silica		0.07
Carbonaceous matter		1.38
Moisture		0.15
		99.43

Just why an occasional log in a coal bed should undergo calcification instead of becoming converted into coal is difficult to understand. Apparently the change took place after the log had become buried in the upper part of the peat deposit which formed the coal bed and the latter had been buried under a load of sediment sufficiently great to exert the pressure necessary to flatten the log. Waters charged with calcium and magnesium carbonates, or possibly sulfates, then permeated the cells and filled them with dolomitic calcite and to a large extent replaced the walls themselves, leaving just sufficient carbonaceous matter to emphasize the outlines of the original cellular structure. The pyrite was brought in in solution at a somewhat later stage and has replaced portions of the calcite. The above described occurrence, in many respects, bears a close resemblance to the calcareous concretions or "coal balls" so rich in well-preserved plant remains, which are occasionally found associated with coal seams, and the process of formation was undoubtedly very similar.

Dr. O. E. Jennings, of the Carnegie Museum, is at present working on the identification of the specimen. A preliminary examination reveals conifer-like structures indicating that the log may represent one of the cordaites.

A NEW THEORY OF THE COMPOSITION OF THE ZEOLITES. PART II

(*Continued from page 97*)

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2. The Composition of Natrolite, Mesolite, Scolecite, Gismondite and Laumontite

The so-called "natrolite group" of zeolites furnishes one of the most striking examples of the apparent validity of valence-control of isomorphous replacement. It is well known that this "group" consists of the following minerals, the composition being given as heretofore commonly accepted:

Natrolite	$Na_2Al_2Si_3O_{10}.2H_2O$	$a{:}b{:}c=0.9786{:}1{:}0.3536$
Mesolite	$\left\{\begin{array}{l}Na_2Al_2Si_3O_{10}.2H_2O\\ 2CaAl_2Si_3O_{10}.3H_2O\end{array}\right\}$	$a{:}b{:}c=0.9747{:}1{:}0.3122$
Scolecite	$CaAl_2Si_3O_{10}.3H_2O$	$a{:}b{:}c=0.9763{:}1{:}0.3433$