

BOOK REVIEWS

CONFERENCE ON THE ORIGIN AND CONSTITUTION OF COAL, sponsored by NOVA SCOTIA DEPARTMENT OF MINES AND NOVA SCOTIA RESEARCH FOUNDATION, Crystal Cliffs, Nova Scotia, June 21-23, 1950. 159 pp., 1951.

The proceedings of the conference on the origin and constitution of coal at Crystal Cliffs centered around two major papers relating to coal geology in Nova Scotia, one by Dr. P. A. Hacquebard, Coal Petrographer, Fuel Division, Geological Survey of Canada, entitled "The Nomenclature and Classification of Coal Petrography," and the other by Dr. T. B. Haites, Geologist, Fuel Division, Geological Survey of Canada, on "Some Geological Aspects of the Sydney Coal Fields with Reference to their Influence on Mining Operations." Only the first paper is printed in these proceedings, the other being published in the *Proceedings of the Canadian Institute of Mining and Metallurgy*. In addition to the paper by Dr. Hacquebard the volume contains articles by Dr. A. T. Cross entitled "Plant microfossils and the application of their study to coal stratigraphy," and "Pennsylvanian stratigraphy and sedimentation of the Northern Appalachian region," one on "Metamorphism of coal" by Dr. A. Lahiri, which, however, was not given at the conference, and a version of which appears in *Economic Geology*, 46, no. 3, 252-266 (1951); a paper on "The vacuum differential thermal analysis of coals," by Prof. W. L. Whitehead; one on "The chemical and structural relationships of lignin to humic substances," by Dr. Irving A. Berger, Illinois (also *Fuel*, 30, no. 9, 1951), and one by I. A. Berger and W. L. Whitehead on "A thermographic study of the role of lignin in coal." Dr. B. R. MacKay, Chief Coal Division, Geological Survey of Canada, presented a short discussion on the coal resources of Nova Scotia at the opening of the conference.

In addition to these papers there is a fairly complete record of the discussion obtained with the aid of a tape or wire recorder.

The paper by Dr. Hacquebard is noteworthy because it represents the first presentation in North America of the European method of coal petrography based almost exclusively on polished surface technique rather than upon thin sections. The article is an exceedingly good presentation of the general principles and nomenclature of coal petrography from the point of view adopted. A useful system of coal petrography classification defines the limits between the different varieties of coal on the basis of the proportion of the vitrain on the one hand and opaque matter (micrinite) on the other. Likewise 5 varieties of banded coal grading from bright through semi-bright, intermediate coal, semi-dull coal to dull coal are proposed on the basis of the amount of the megascopically bright ingredients present (vitrain, clarian, and fussain). One of the chief items of discussion following the paper concerned the method and validity of identification of opaque matter (micrinite) that forms the ground mass of splint coal (durain) using incident light. Some of the pictures on display showing what was identified as micronite (Pl. IV, no. 3, Pl. VI no. 2 and no. 6) seemed to some of those present to be resin bodies which are translucent in thin sections, although somewhat less so than vitrain. Comparison of photographs of polished surfaces and of thin sections in half tone reproductions fail to show the full value of thin sections because the colors of the thin sections are very important aids in the identification of the constituents.

Dr. Cross's paper on plant microfossils explained the nature of spores and pollen grains and the use of these fossils in coal bed correlation. The procedure of stratigraphic studies followed by the West Virginia Geological Survey was outlined. The stratigraphic studies of the Pennsylvanian system in the Northern Appalachians have been carried on by making considerable use of the cyclic repetition of beds which characterizes the Pennsylvanian in this region as well as in other coal fields in eastern United States. At the same time the

importance of "key" beds in mapping is recognized. Both of the papers by Dr. Cross were profusely illustrated at the conference.

The article by Dr. Lahiri, Director of Fuel Research Institute, Bahar, India, which was not presented at the conference, presents a number of controversial ideas, adequate consideration of which is impossible here. In his summary the author states that "coal is a polydispersed colloidal system, the degree of polymerization being enhanced by metamorphic processes." Ignoring the fact, as coal paleobotanists have long since demonstrated, that vitrain represents coalified woody tissue, Lahiri suggests that the banded structure is of secondary origin arising from a process of gel coagulation and expulsion. One wonders whether or not the Lahiri theory could be adjusted to fit more consistently with the facts in regard to coal banding as determined by botanical studies.

The articles in the field of thermal analysis and the study of lignin by Breger and Whitehead present the results of some studies that have recently been carried on at the Massachusetts Institute of Technology. Various thermograms are shown, but Dr. Whitehead definitely recommends caution in the interpretation of results. There is so little published information concerning the thermal analysis of coal that the significance of the curves shown in this publication cannot be fully understood, if indeed it is certain that they have significance. However, Dr. Breger seems somewhat more inclined to regard the early part of the thermograms of lower rank coal as more indicative of the origin of coal from lignin rather than from cellulose. It may be pointed out that the thermograms of the bituminous coals, except low volatile coal (Fig. 7, no. 88, p. 133) tend to a fairly strong exothermic reaction around 400 to 450 degrees C followed by an exothermic reaction between 450 and 600 degrees C which is again followed by an endothermic reaction. This intermediate endothermic action appears to correspond to the loss of bituminous smoke-producing substances that characterizes the early stages of the carbonization of these coals as has been pointed out many times. Breger presents three infra-red absorption analysis curves for humic acid and spruce lignin. This method of analysis would appear to be applicable in determining the nature of the chemical substances found in coal. It is possibly applicable in the determination of the presence of bituminous substances—waxes and resins in coal. It may be noted that for the various bituminous coals examined by thermal analysis (Fig. 7, p. 137) low volatile coal alone does not show the exothermic rise between 400 to 450 degrees. This might provide a basis for classification of this and higher ranks of coal.

It is believed that this publication deserves the careful attention of people interested in the geology of coal.

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STRUKTUR UND EIGENSCHAFTEN DER KRYSTALLE. Eine Einführung in die physikalische und chemische Krystallkunde by HELMUT G. F. WINKLER. Springer Verlag, Berlin/Göttingen/Heidelberg (1950). viii+258 pp., 1 pl., 62 text figs., 78 tables. Price DM 16.80.

Professor Winkler's book is a synthesis of the current concepts of the relations between crystal structure and a few of the selected physico-chemical properties of crystals. Although intended for a wide audience, the subject matter emphasizes the mineralogic approach. After a brief introduction, the book is divided into two sections: "Crystal Structure and Properties" and "Property and Crystal Structures," representing two approaches to the same subject. The first section contains descriptions of chemical bonding, general kinds of crystal structures and their chemical compositions, and ideal and real crystals. A discussion of the significance of the varying structural features of crystals to the physical and chemical

properties is included in these descriptions. The second part deals with the variations of the following properties with respect to the lattice geometry and to the nature of the chemical bond: heat conduction, compressibility, thermal expansion, optical properties, hardness, and cleavage. An appendix treats mostly of the Hermann-Mauguin symbols for symmetry classes and space groups. As a means of emphasizing the theme of the book, crystal structures are classified as isometric or anisometric; the anisometric group is further separated into sheetlike, sheet, chainlike, and chain structures.

The book is an outgrowth of Professor Winkler's lectures at the University of Göttingen in 1949. The reader is constantly reminded of this origin by the organization, the repetition of fact and kind of example, and by the uneven treatment of the different subjects. In a few places, the subject matter is discussed too briefly for adequate comprehension. The text is exceptionally clear and lucid. The illustrations are in unfavorable contrast to the text; they are poorly tied into the text, and very few are self-explanatory. Several complicated points would be clearer had more illustrations been used. The numerous tables add little, being a sort of repetition of what has been clearly stated in the text.

The book is essentially an excellent introduction to the subject matter and is not a reference book. The treatment is qualitative and the more important references are included for those who wish to delve deeper into the subject. The German is unusually simple and clear. For these reasons the book should be well received by the many geologists interested in this aspect of crystallography, but who are unwilling to wade through the usual complex mathematical presentations. The section on cleavage is especially interesting and is the latest attempt to explain cleavage on the basis of inherent structural properties rather than on lattice defects. This section is a condensation of Winkler's article in the Heidelberg *Beiträge zur Mineralogie und Petrographie* (Bd. 2, p. 255, 1950).

The book is clearly printed on good quality paper; the covers are paper.

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SCHWEFEL IN SCHLACKE UND SCHLACKENWOLLE, by Dr. Ing. WALTHER FISCHER and Dr. rer. techn. SIEGFRIED WOLF. E. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart, Germany (1951), 231 pp., 1 fig., 53 tables, paper DM 25, bound DM 27.

The title of this book suggests a work of limited interest. To this reviewer, however, the many facets of the problem of sulfur in silicate melts was indeed revealing. The many forms in which sulfur may occur in slags: elemental, sulfide, sulfite, sulfate, silico-sulfate and others, and their intricate equilibrium relationships, create problems of considerable complexity. This book brings together the known data.

Even small quantities of sulfur in silicate melts may have important effects, some beneficial, some deleterious. The utilization of slags, of which tremendous quantities are available, is hindered by the nature of their sulfur content. Through an adequate knowledge of the role of sulfur in these slags appropriate manipulations can often be devised to convert the useless into valuable materials.

The book is divided into six sections: (1) the general nature of slags, devoted to the mineralogy of silicate slags, (2) source of sulfur in slags, from fuels as well as the raw materials, (3) effects of sulfur in slags and slag products, (4) the various forms of sulfur in slags, including the numerous sulfur-bearing compounds occurring in them, (5) thermochemical considerations, and (6) a résumé. A pertinent bibliography of 162 titles is included, as well as an author and thorough subject indices.

The book should be of particular interest to the technologist in smelting and steel manufacture, cement, glass and rock-wool insulation products, and concrete construction.

There is also much of interest to the geochemist, mineralogist, petrologist and economic geologist with a particular interest in sulfide ores.

W. F. FOSHAG

STRUCTURE REPORTS FOR 1947-1948. Vol. 11. General Editor, A. J. C. WILSON; Section editors: C. S. BARRETT (Metals), J. M. BIJVOET (Inorganic compounds), J. M. ROBERTSON (Organic). Published for the International Union of Crystallography. N.V.A. Oosthoek's Uitgevers Mij, Utrecht. x+779 pp. (1951). Price 55 Dutch guilders, postpaid.

It is gratifying that this very important compilation of crystal structure data is now available, and that plans are underway to fill the gap between this volume and the last *Strukturbericht*, Vol. 7 (1939), as well as to continue the series for the years since 1948. The structures of about 800 substances, published in 1947-8, are included. It has been the aim of the editors to make these reports such a complete record of the data that reference to the original work will be unnecessary in most cases. On the other hand, data of non-structural interest is not included, even though it be of great importance in the original article.

Separate sections in the volume are devoted to Metals, Inorganic Compounds, and Organic Compounds. The order of listing differs from that used in the *Strukturbericht*, and is described in the introduction. In most cases readers will find it desirable to use the indices. Both subject and formula indices are included, as well as an author index.

This volume represents an international undertaking, and in spite of the difficulty of having editors in different countries, a very creditable volume has resulted, and has appeared in a remarkably short time. The editors and abstractors who have labored to produce this volume are very deserving of thanks from the many workers in the field of crystal structure who will be using these reports for years to come.

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DIE LAGERSTÄTTE DER TREPČA UND IHRE UMGEBUNG, by Professor Dr. Ing. F. SCHUMACHER. Published by Izdavačko Preduzeće Saveta Za Ernegetiku I Ekstraktivnu Industriju Vlade Fnrj. Belgrade, 1950, 65 pages, 6 illustrations and 12 tables with geological horizontal sections through the deposit. Two colored geological maps, scale 1:5000 and 1:20,000. Can be obtained for DM 10. at the following address: Professor F. Schumacher, (14b) Spaichingen, P.O. Box 41, Württemberg, Germany.

The author of this bound book, written in German, was formerly Director of the Geological Institute at the Bergakademie in Freiberg, Saxony. During recent years he has served as geologist at Trepča and had an opportunity to make a thorough study of this unique deposit. The Trepča deposit was developed by The Selection Trust, London, and is in the mountainous district of southern Serbia.

According to Professor Schumacher, Trepča is considered one of the most remarkable lead-zinc ore deposits of the world, formed by metasomatic action and related to young volcanic intrusions.

It is not only for the unusual character of this ore deposit that the book by Schumacher is mentioned here, but more especially to call attention to the exceptional mineral specimens that may be collected at Trepča. To mention only a few the reviewer should like to stress the extraordinary large and beautiful crystals of dolomite, rhombohedrons measuring 16 cm. on edge; the large hexagonal plates of pyrrhotite; the unexcelled pseudomorphs of

pyrite after pyrrhotite; choice specimens of plumosite; vivianite crystals (7 cm.×2 cm.), transparent, with a green color and of superb quality, etc.

A detailed crystallographic description of these minerals will be published later.

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NEW MINERAL NAMES

Allevardite = Caillèrite = Tabulite = Dérivée

This spate of names refers to a peculiar mineral previously described as kaolinite (S. Caillère, *Compt. Rend.*, **198**, 179 (1934)), as mica (E. Lemoine, *Bull. hist. nat. Savoie*, **23**, 199 (1935)), as palygorskite (S. Caillère and S. Hénin, *Compt. rend.*, **222**, 238 (1946)), and finally as a new mineral named allevardite (S. Caillère and S. Hénin, *Compt. Rend.*, **230**, 668-669 (1950); S. Caillère, A. Mathieu-Sicaud, and S. Hénin, *Bull. soc. franc. mineral. crist.*, **73**, 193-201 (1950)). In discussion (*Bull. soc. franc. mineral. crist.*, **73**, 142, 146 (1950)), the name allevardite was objected to on the ground that the occurrence was 15 km. distant from the Allevard region, the alternative names caillèrite, tabulite, and dérivée were proposed, and it was agreed that the name caillèrite was preferred.

Analyses of 1. A yellow variety. #2. A greenish-white variety gave:

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	CaO	MgO
1.	45.20	30.05	1.07	0.20	4.62	0.34
2.	46.17	29.43	0.59	0.15	3.20	0.45
	K ₂ O	Na ₂ O	H ₂ O ⁻	H ₂ O ⁺	Sum	
1.	0.33	2.83	9.72	6.04	100.40	
2.	0.92	3.81	9.23	5.59	99.54	

From analysis (1), after deducting CaO, "which is very probably present as impurities," the formula "[Al₂(OH)₂(Al_{0.3}Si_{3.3})]·0.5 (Na₂O)O₁₀" is deduced. The mineral swells in water to form a gelatinous mass. Base exchange occurs on treatment with ammonium carbonate. Dehydration curves are given.

The mineral is fibrous, matted like papyrus. Electron microscope photographs show it to be made up of ribbons, some of which are folded or bent. The ribbons are 0.5 to 1μ wide by 10μ long and are about 100 Angstroms thick. Cleavage basal, perfect. Yellow to greenish-white. Biaxial, mean $n = 1.550$. $G = 2.36$.

X-ray study gives $d_{001} = 22.5 \text{ \AA}$; when the mineral is saturated with glycerol, $d_{001} = 25.6 \text{ \AA}$. The powder pattern of material heated at 500° is apparently that of a mica, with $d_{001} = 9.5 \text{ \AA}$. The mineral is believed to consist of mica layers, generally grouped in pairs and separated by a layer of water molecules.

NAMES: Allevardite for the Allevard region, Isère, France; tabulite for La Table, Savoy, France (the actual locality); dérivée for Mr. Dérivée; caillèrite for Miss S. Caillère.

DISCUSSION: The evidence is insufficient to justify a new name. In the present confused state of the nomenclature of the clays and micas, restraint is desirable and new names should not be proposed for poorly defined material. In particular, the deduced formula can not be accepted, since it was derived by deducting 4.62% CaO and nothing else. Obviously the analysis is faulty, or something else has to be deducted, or both.

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