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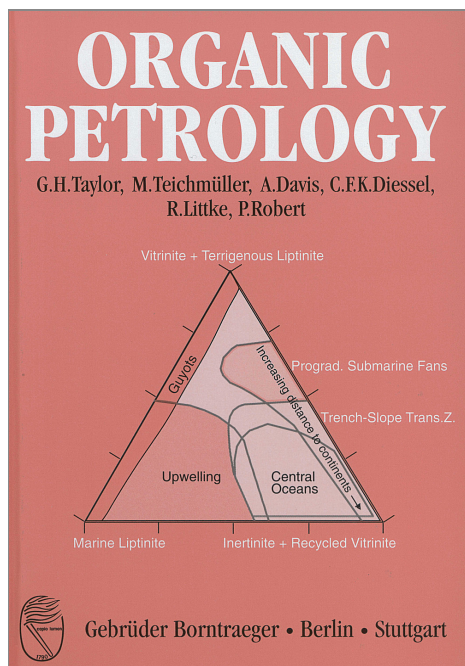
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Organic Petrology

A new handbook incorporating some revised parts of Stach's Textbook of Coal Petrology

Ed.: G.H. Taylor; M. Teichmüller; A. Davis; C.F.K. Diessel; R. Littke; P. Robert

1998. XVI, 704 pages, 349 figures, 70 tables, 18x25cm, 1770 g

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"Organic Petrology" is a new book, but one with antecedents. It is rooted in the famous "Stach's Textbook of Coal Petrology" (1975) and its predecessor "Stach's Lehrbuch der Kohlenpetrologie" (1935) but has been completely revised and expanded in order to incorporate a huge amount of new data obtained in the two decades since the publication of the 3rd edition of Stach. "Organic Petrology" now covers the whole field of the petrology of organic material in rocks.

This book, which is relevant for all those whose work is related to coal, oil and gas source rocks, and other organic matter which occurs in rocks, deals with: characterization, microstructure; geology and biology of formation of organic matter; maturation and increase in coal rank and the generation of hydrocarbons which takes place concurrently; experimental organic petrology; physical and chemical properties of organic compounds in rocks; industrial processing of coal and the application of organic petrology in solving geological problems (such as determining rates of subsidence, thermal histories).

Sections which introduce major topics are organized so as to allow easy access to the topic, even for the non-specialist. No field of science can avoid the use of technical terms -- these are explained when they are used for the first time.

The text is supplemented by an exhaustive reference list and a subject index. Information on the worldwide stratigraphic distribution of coal deposits and organic matter-bearing rocks, is included in an appendix.

"Organic Petrology" was authored by a team of six high ranking authors, coordinated by G.H. Taylor, ANU, Canberra. The number of authors reflects the breadth of organic petrology that this book covers. Some material, revised and updated, was incorporated from the classic "Stach's Textbook of Coal Petrology" which this new book supplants by providing a greatly broadened view of organic matter in rocks and drawing on up to date research results and recent publications. Five colleagues of the authors made contributions to bring some specialty sections up to the state of the art.

The book addresses researchers, undergraduate, graduate and postgraduate students, people concerned with the assessment, mining and use of coal and oil shales, and exploration workers interested in the occurrence and the evaluation of petroleum and natural gas and their source rocks.

Book Review, ICCP News, no. 19, April 1999

Review by Jack D. Burgess, Humble Geochemical Services, Humble, Texas.

This volume of nine chapters covers the subject of organic petrology and were written by six major and five contributing authors. Chapters are of varying length with the Introduction and historical survey consisting of 5 pages and the longest chapter on Methods with 112 pages. The chapter headings include: Introduction and Historical Survey, The Origin of Organic Matter in Sedimentary Rocks, Coalification and Maturation, The Nature of Organic Matter - Macerals and Associated Minerals, Lithotypes and Microlithotypes, Some Important Coals and Other Carbonaceous Rocks of the World, Methods and Procedures, Geologic Applications, and Technological Applications. Each chapter contains a short introduction and then greater details as individual topics are developed. The table of contents along with an extensive subject index following the references makes for easy access to a specific topic. This book is unique in functioning both as a handbook of techniques in coal and organic petrology as well as a complete reference guide.

The Introduction and Historical Survey brings together into a few pages the important work of individuals, and the International Committee for Coal and Organic Petrology (ICCP) in establishing coal petrology as a descriptive science. The historic trends of the Stopes-Heerlen terminology usage are well covered and makes clear the debt owed these many early coal scientists.

Chapter 2 on The Origin of Organic Matter in Sedimentary Rocks was written by M. Teichmüller, R. Littke, and G.H. Taylor. The chapter is entitled Deposition and preservation of organic matter in sedimentary rocks other than coal, and covers such diverse topics as climate paleogeography and environments of deposition, types of deposition, peat forming communities, accumulation rates of organic matter-rich sediments other than coal, and migrabitumen in rocks. In the section on deep marine environment the authors develop a triangular diagram depicting maceral associations in small oceanic basins and along passive continental margins, and which is also used as a logo on the book cover.

Chapter 3, 4, and 5 cover Coalification and Maturation, The nature of organic matter - maceral and Associated Minerals, and Lithotypes and Microlithotypes. The subjects are well covered in these chapters with many new diagrams and cross-sections, and some that have been seen before. Also noted are sections dealing with organic matter-rich sediments other than coal, the calibration of vitrinite reflectance in basin modelling, and macerals in oil shales and other petroleum source rocks. The recognition and application of coal petrology to rocks other than coal is a most welcome trend, and the authors are to be commended for this emphasis.

Chapter 6: Some important Coals and Other Carbonaceous Rocks of the World was written by G.H. Taylor and collects a great amount of material on organic-rich rocks and coals worldwide. Reading this chapter and referring to the colored stratigraphic column in Appendix 1, graphically showing occurrences of carbonaceous rocks from the Phanerozoic to the Pliocene and reveals the ubiquity of carbonaceous rocks through time. A conclusion by the author shows that carbonaceous rocks were deposited in every geologic age and have been exposed to a variety of post depositional conditions, yet there is no consistent correlation between age and rank. Some carbonaceous rocks of Precambrian age, have never been exposed to temperature > 100°C, while some Tertiary coals are of bituminous or even anthracite rank.

Chapter 7 covers Methods and Procedures and is the longest segment of the book with 112 pages. It was written by A. Davis, D.C. Glick, M. Vanderbroucke, and J. Espitalié. This chapter starts with Sampling methods and preparation procedures and leads to a Description of coals, and oil shales, with preparatory techniques for coal, strew mounts and well cuttings. Reflectance analysis is described along with recording and reporting of data. Automated image analysis is discussed, described, and compared with manual methods. Complimentary geochemical methods to augment organic petrography are covered along with interpreted gas chromatograms of kerogen types I, II, and III. Etching and staining hardness, microstructure in coals and chars are covered in detail.

Chapter 8 covers Geological applications and was written by M. Teichmüller, P. Robert, R. Littke, and M. Smyth. This chapter is divided into 7 sub-headings including Methodology of Organic Petrology Applied to Solving Geologic Problems; Diagenesis Through Metamorphisms and its Relationship to Concurrent Rock Interactions; Uses of Organic Petrology in Crustal Distensions and Convergence Systems Exploration for Hydrocarbons, Source Rocks, Maturity, Limits of Maturity for Oil and Gas Occurrences, Coal as a Source and Reservoir Rock, and Four Basin

Studies Utilizing Organic Petrology; Ore and Mineral/Organic Matter Interactions; and finally Applications in Soil Science, Archaeology, and Effluent Studies. This chapter will be the one most referred to by those exploring for oil and gas.

The final chapter, Chapter 9 in the book, was written by C.F.K. Diessel with assistance from M. Smyth. The chapter is divided into seven major-sub-headings: Coal Exploration and Preparation, Coal Carbonization and Petrology of Coke, Coal Combustion, Coal Gasification, and Liquefaction, and Coals for Other Industrial Purposes. The authors set the stage for the subjects in their introduction, "the emphasis of the discussion is on the important role the microscope has played in developing an understanding of the function of coal and its components as a chemical feed stock and provider of energy." For one who is not well versed in this field as I am not, the authors do a first-rate job of leading one through these technical subjects in a logical and comprehensive way, and at the end of the chapter you feel a good grasp of the subject matter, and a ready reference to their technology. This book is a must have for all practicing coal and organic petrologists, and should be an available reference for all organic geochemists.

ICCP News, April 1999, no. 19

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This is an authoritative and comprehensive handbook of coal petrology, with additional information on petroleum. It is a new compilation but acknowledges some of its inspiration from successive editions of the International Handbook of Coal Petrography and the pioneering work in Stach's Textbook of Coal Petrology, starting from 1935 (Lehrbuch der Kohlenpetrographie). Topics include: petroleum source rocks and other rocks with organic matter; metallurgical coke; methodology; microstructure; petrogenesis; maturation; experimental organic petrology; industrial processing of coal; and applications to some broader geological problems. Illustration is generous and includes numerous photographs, some in colour. A handy appendix features coloured stratigraphic columns showing the age distribution of some rocks mentioned in the text. The authors are of international repute and have commendably aimed to make the book readable by the non-specialist: Taylor is from the Australian National University and Diessel from the University of Newcastle, Australia.

There is a short but interesting historical introduction which includes photographs of eight of the earlier workers such as Thiessen, Marie Stopes (also pioneering birth control), Potonie and Marshall. In describing the subsequent chapters in decreasing order of length, Methodology (Chapter seven) takes first place, starting with coal sampling and including the preparation of polished blocks, measuring reflectance, video image analysis, fluorescence microscopy, etching and staining techniques, and the microscopy of chars and flyash. Almost as long is the chapter on Macerals and Associated Minerals (Chapter four) which define the heterogeneous nature of coal and other organic matter at various levels of magnification. The groups described are vitrinite, liptinite, inertinite, macerals of oil shales, inorganic matter such as quartz and sulphides, and trace elements. A long final chapter (Chapter nine) covers technological applications of organic petrology to coal exploration, preparation, carbonisation, combustion, gasification and liquefaction.

Reverting to shorter, but important chapters, in order of appearance: Chapter two is on the origin of organic matter in sedimentary rocks, mentioning the origin of mines, coal facies, Beatification, and depositional environments of oil and gas source rocks; Chapter three covers coalification and maturation; Chapter five is on lithotypes such as vitrain in humic coals, with description of sapropelic coals and carbonaceous elastic rocks; Chapter six usefully covers important coals and carbonaceous rocks of the world, including Carboniferous, Permian, Mesozoic, Tertiary and Quaternary coals; while Chapter eight covers geological applications of organic petrology such as rank determination in sedimentary rocks, study of diagenesis and metamorphism, ore genesis, petroleum exploration, and archaeology. Kimmeridge sapropelite "coal" from Dorset was widely used as early as the Bronze Age to make objects such as amulets and bowls.

Reviewed by the Australian Mineral Foundation in AMF ALERT 2 (3) 2000

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