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NEWS OF THE INTERNATIONAL COMMITTEE FOR COAL AND ORGANIC PETROLOGY

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Letter of the Editor

As all ICCP members know from the circulars of the 45th Annual Meeting, this year a custom of the first ICCP meetings was resumed, the integration of lectures - and now also posters - in the programme. Until now no decision was taken whether the papers and the wordings of the posters should be printed in separate proceedings or offered to an international journal. As a provisional solution it was decided by the council to print this year the abstracts of all presentations in our ICCP news. These abstracts you will find subsequently to the minutes of the last meeting. Hoping you enjoy this issue of the news, I remain

Monika Wolf

Minutes

of the 45th Annual Meeting of ICCP, held at Chania, Crete, Greece, September 26 - October 02, 1993

by
Zuleika Carretta CORREA DA SILVA,
General Secretary

1. General Course of the Meeting

The 45th meeting of the ICCP took place at the Technical University of Crete, in Chania, Crete, Greece from September 26 to Oktober 2, 1993. It was attended by the President, Dr. Alan Davis, 37 ICCP members (25 full members and 12 associate members) and 28 visitors representing 21 countries. The meeting was officially opened at the Plenary Session by the President who thanked the Chairman of the Organizing Committee, Prof. A.E. Foscolos, and the staff members who helped in the organization of the meeting.

Apologies

Apologies for absence have been received from Paul Lyons, Neely Bostick and Joseph Senftle (USA), Helmut Jacob, Marlies Teichmüller, Werner Hiltmann and Eva Wolff-Fischer (Germany), Duncan Murchison (UK), F. Goodarzi (Canada), Rosa Menendez (Spain), Krystyna Kruscewska (Poland), M.J. Lemos de Sousa and Henrique Pinheiro (Portugal), Richard Sykes (New Zealand), Yvonne Somers (Belgium) and Boris Alpern (France).

Treasurer's Report

In the absence of the Treasurer, Prof. Duncan Murchison, the President reported that the accounts cover the period from 1.7.92 to 10.8.93. The total balance is £ 21107,09. The Handbook account balance is £ 2510,09.

The President reported also that the 3rd Supplement of the Handbook was fully reprinted and is now available (250 copies have been printed). Order Forms are available from Prof. D. Murchison, Newcastle Research Group in Fossil, Fuels and Environmental Geochemistry, Drummond Building, The University, GB-Newcastle upon Tyne NE1 7RU, U.K.

Membership

Dr. Walter Pickel, Germany, was elected to FULL Membership of the ICCP. The following were elected to ASSOCIATE Membership:

Michael Cloke, UK
Sharon S. Crowley, USA
Petra David, The Netherlands
Juan Manuel Garcia Cuevas, Mexico
Maria Angeles Gomez Borrego, Spain
Thimothy Allen Moore, USA
Grzegorz J. Nowak, Poland
Henrik Ingermann Petersen, Denmark
Brenda Pierce, USA
Svend Stouge, Denmark
Harry Veld, The Netherlands

Long-standing Associate Members are asked to apply for Full Membership (conditions see Statutes, § 3)!

Thiessen Medal

The Thiessen Medal was awarded in absentia this year to Dr. Helmut Jacob for his outstanding work on bitumen classification. The Laudatio was read by the President and the document will be presented to Dr. Jacob by Prof. Diessel, the chairman of the Award Committee.

Forthcoming Elections

The following elections will be called during the year: Chairman of Commission II and Secretary of Commission I. The General Assembly approved the nominations presented by the Council for Chairman of Commission II - Dr. Wolfgang Kalkreuth and Dr. Werner Pfisterer - and for Secretary of Commission I - Dr. Walter Pickel and Dr. Rolf Wartmann.

ICCP Representation in the ECE-UN

The President reported about his participation in the ECE-UN ad hoc-meeting of the "Working Party on Coal", held in Geneva, September 1992. The group discussed for the last time the so-called Alpern's Coal Classification and minor modifications were made. The President explained that this is a non-commercial classification but an attempt to reach an "International Classification of Seam Coals" to be used by the geologists to classify "in situ" coals. The next meeting will be held in Geneva in October 1993.

ICCP Brochure

The President showed a first version of the brochure dealing with ICCP aims and purposes which was approved to be printed in the near future.

ICCP Archives

The General Secretary suggested to house at the Technical University of Aachen, Germany, the dispersed archives of ICCP which are with Dr. Noel, in Liège and with Prof. Wolf, in Aachen. Later on the President will send to Aachen the material which are with himself and Prof. Spackman, at Penn State University. Dr. A.H.V. Smith suggested to search for the ICCP archives in United Kingdom.

ICCP Statutes

ICCP members will be asked during the year to accept modifications in the Statutes.

Future Meetings

The next meeting of the ICCP will take place in the Instituto Nacional del Carbon, in Oviedo, Spain during the month of September 1994. Invitations to host the 1995 and 1996 meetings in Cracow, Poland and Heerlen, The Netherlands, respectively, were offered and approved by the General Assembly.

Social Programme and Field Trip

On Sunday, September 26, an Icebreaker Party was held in the garden of the conference building. A typical Greek night, with dinner and dances, was held in the "Costas Tavern" on Tuesday, September 28.

The field trip was directed to the Ptolomaes Lignite Mine, Macedonia, north of Greece, during Friday and Saturday, October 1 and 2. The explanations in the field were completed by an excellent guidebook.

2. Reports of the Commissions

2.1 Commission 1: General Coal and Organic Petrology

Chair: Alan Cook in the absence of Manuel Lemos da Sousa
Acting Secretary: Jane Newman

2.1.1 WG Standardization - Convener: Walter Pickel

Samples of a Jurassic coal from China (RIC 92) were sent to 40 participants. 18 participants reported maceral analyses and reflectance measurements. Agreement was better in the reflectance work than in the maceral analyses. Mineral matter results were again poor, perhaps due to confusion with liptinite. Vitrinite values commonly fell outside the ISO limits.

Overall, the results are regarded as satisfactory. Future exercises may utilise the proposed new vitrinite classification. In future, the analysts will be asked to record in more detail their methods, and further standardization will be developed.

The samples and instructions of the RIC 93 round robin - focussing on the new vitrinite classification - are automatically distributed to those, who took part in the RIC 92 ring analysis and those, who indicated their interest at the meeting in Chania. Further interests please contact: Walter Pickel, Lehrstuhl für Geologie, Geochemie und Lagerstätten des Erdöls und der Kohle, Aachen University of Technology, D-52056 Aachen, Lochnerstr. 4-20, Germany.

2.1.2 WG fluorescence analyses - Convener: Karl Ottenjann

Alan Davis stated that the working group has experienced problems during past three years. Ottenjann has prepared a sheet, but was unable to attend the last meetings due to the lack of support by the Geological Survey at Krefeld. He sent his draft for attention by a committee headed by Thompson Riser. A response was returned to Ottenjann. Considering the unfavourable factors, Davis recommends Thompson Riser and Rui Lin continue as editors with Stephen Bend as the convener.

2.1.3 Establishment of a new Working Group: Microlithotype nomenclature for lignites

The proposal was put by Wolf in the absence of the expected convener, Schneider. Wolf backgrounded the work undertaken by Schneider on lignite maceral constituents. He is willing to work towards a microlithotype system. This has been a problem area for some years and no-one has been prepared to take responsibility until now. Wolf outlined his proposed scheme. Two groups of microlithotypes are recognised. -

Those, who wish to participate in this WG should contact Dr. W. Schneider, Am Bahnhofsvorplatz 17, 02977 Hoyerswerda, Germany.

2.1.4 WG accreditation system - Convener: Reinhold Kutzner, Report by Rolf Wartmann

Since the last report at Penn State only a few new results had become available. Of 40 laboratories, 24 have reported so far. This is not enough for reliable determination of "accurate" modal values. Mean results obtained by expert analysts could be used as the correct values, but who can be designated as the experts? Smith has suggested using the modal value of all data, except for extreme values which can be eliminated. Only one result has so far fallen outside twice the reproducibility, but elimination of this value does not change the modal result, so it has not been eliminated.

Ideally 3 people from each laboratory should undertake the analyses. There is a need to decide on an acceptable evaluation method. After this has been established it would be necessary to start again, with each laboratory taking part and reporting over a period of a few months.

Results to date were presented in tabular form, and accuracy achieved by each participating laboratory (designated by number) indicated according to categories A, B and C. In his report, Kutzner suggests that a C grade does not qualify for the letter of accreditation.

It was agreed that a client would know that his result was provided by the accredited analyst from a signature on the analysis sheet. The analyst rather than the laboratory would be accredited. However, if an analyst moves to a different laboratory, both the laboratory and the analyst lose accreditation until it is re-established by a new set of analyses.

Diessel suggested the use of ICCP funds to have the samples prepared commercially, and avoid burdening ICCP members who have little time. This proposal was accepted by the President.

2.1.5 Vitrinite classification - Editorial group: Wolf, Diessel, Kalkreuth, Smith

The Chair of the meeting presented the salient points from Marlies Teichmüller's letter to the Commission and these are listed in the full minutes.

The present session followed the discussions at Penn State and a postal vote as a result of which agreement had been obtained to proceed with development of a classification based on three sub-groups and two macerals within each sub-group. Wolf was invited to present the proposals from her working group.

She explained the revised vitrinite classification, as previously discussed at the 1992 meeting and in the postal vote. Copies of the pages of new and revised definitions were made available. The terms for higher rank coals can be readily correlated now with those of low rank coals. The individual sub-groups and macerals were discussed.

Commission I agreed to adopt the subgroup sheets as proposed, subject to editorial changes (these will include general editorial changes, addition of related terms section, and any changes to definitions that are required to take account of decisions related to the maceral sheets) with the names telovitrinite, detrovitrinite and gelovitrinite. This proposal is now put to the Plenary Session for ratification. Final ratification will await the final revisions and should take place at the Oviedo meeting.

Commission I also agreed to the sheets for telinite, telocollinite, detrovitrinite and collodetrinite subject to editorial changes (these will include general editorial changes, addition of related terms section, and any changes to definitions that are required to take account of decisions related to the maceral sheets). As with the sub-group sheets final ratification will await the final revisions and should take place at the Oviedo meeting.

2.2 Commission 2: Application of Coal and Organic Petrology to Geology, including the Prospecting for Oil and Gas

Chair: Wolfgang Kalkreuth in the absence of J. Senftle
Acting Secretary: Walter Pickel

present 28 members of Commission II and 9 guests

2.2.1 Environmental applications of organic petrology (Joint session of commissions I, II and III)

A proposal put by J. Senftle was presented by W. Kalkreuth, that the ICCP should add environmental applications of organic petrology. Possible fields of interest, that had been discussed at the previous meeting at Penn State University and those added at the present meeting were: coal dust, fly ashes, soils and peats, stockpile water passage, airborne dust, waterborne dust, mineral matter, trace elements, forensic studies, dust.

J. Bailey and D. Pearson volunteered as conveners to specify more clearly possible fields, to collect proposals and especially case histories. Those interested to participate are asked to send proposals and/or case histories to

- Dr. J. Bailey, Department of Geology, University of Newcastle, Newcastle N.S.W. 2308, Australia
- Dr. D.E. Pearson, D.E. Pearson & Associates Ltd., 4277 Houlihan Place, Victoria, British Columbia V8N 3T2, Canada

2.2.2 WG Isolation of organic matter - Convener: J. Castano

Two samples of the Chattanooga Shale (early Carboniferous - Devonian) were distributed to 28 analysts for a round-robin on
- original rock
- isolated kerogen
- strewn slide of isolated kerogen
- ground and homogenized rock

to check on the influence of different sample treatment and analysis methods.

As to the date of the meeting just 8 analysts had sent back their results (most of them to late for a reasonable interpretation and comparison of the data), the result of the round robin up to now is considered to be preliminary. Nevertheless, some information could be gained from the data present:
- Rr data in general are in good agreement
- in isolated material part of the structured matter seems to be lost. So checking on the whole rock is a useful addition of the analysis.

It was concluded to
- fill in gaps (missing data) until the next meeting
- to add sediments with higher rank organic matter (0,7 - 0,9 % Rr) to the round robin (will be supplied by W. Kalkreuth)
- to organize a microscopy session at the 46th ICCP-meeting in Oviedo.

2.2.3 WG "Thermal Indices" - Convener: B. Pradier

A set of 3 coals and 3 accompanying shales from the same stratigraphic units were distributed to 18 laboratories (12 responded). Every participant was asked to perform whatever analyses he wanted, to classify the samples according to rank.

The different rank parameters used, were found to be of varying accuracy. Whereas vitrinite reflectance, MPI1, MPI2 and DNR1 showed low interlaboratory discrepancies, T_{max}, Pr/n-C_{17}, Ph/n-C_{18}, MPR1 displayed high discrepancies. Fluorescence data were not comparable because of the lack of standardisation. TAI determination (on the shales) led to satisfying results, which were better in the lower rank samples.

As the data presented were found to be of great interest, B. Pradier was asked to prepare the results for publication. B. Pradier suggested, that for a next round robin (probably to be started next year) he would like to distribute a more difficult set of samples, for example carbonate source rocks.

2.2.4 WG "Basin Modelling" - Convener: W. Fermont

W. Fermont reported about the round-robin of the working group. Data of a coal-bearing sequence (Westfalian) were distributed and computed by six laboratories with different basin modelling programs. As a result the main difficulty of the unique calibration of the programs with vitrinite reflectance data. The best calibration seems to be achieved by cubic regression (3rd order). Future aims of the group are:
- to establish methods for the screening of Rr-data
- interpretation of outliers.

The round robin is still open for further contributions.

2.2.5 WG Alginite Working Group - Convener: A. Cook

A Cook presented a set of slides, demonstrating the differences between telalginite, lamalginite and bituminite.

He agreed to continue the work on the alginite sheets, to have them ready for final discussion at the next ICCP-meeting. Proposals and comments on the sheets should be sent to: Dr. Alan Cook, Keiraville Konsultants Pty. Ltd., 7 Dallas Street, Keiraville, N.S.W. 2500, Australia.

2.3 Commission 3: Application of Coal Petrology to Utilization

Chair: Claus Diessel
Acting Secretary: Judy Bailey

Attendance: 18 participants including 5 guests

2.3.1 WG on Automation - Convener: David Pearson

Aim of the working group: To develop analytical methods, sample preparation techniques and evaluation methods for the rapid automated analysis of single coals and blends.

Activities: The convener described the results of ring analyses carried out on 2 coal samples. 8 laboratories participated in the exercise. Although the brief restricted the choice of samples to single coals, Sample A actually turned out to be a blend of two coals of similar rank with Rr = 1.13 % and R_{max} = 1.20 % (Pearson values). It was found that the spread of the results obtained by the participating laboratories and the standard deviation were unacceptably high. - Sample B was a high-volatile bituminous coal from W-Virginia with a high liptinite content and with Rr = 0.84 % and R_{max} = 0.89 % (Pearson values). Also in this case the variation was high, but the standard deviation was slightly better than in Sample A.

Future work: The Convener of the working Group suggested

i. that in collaboration with Petra David an ANOVA analysis of variance be performed on the results of the last ring analysis in order to identify the sources of error, and
ii. that another ring analysis be conducted using a high-inertinite and a high-vitrinite coal. It is intended to dispatch these samples to the prospective participants in the exercise before the end of the year.

2.3.2 WG on Combustion - Convener: Judith Bailey

Aim of the working group: To increase knowledge of the combustion behaviour of coals and to develop a char classification which is not only reproducible but also an meaningful tool for the correlation of coal composition with optical char properties and char combustion.

Activities: The convener outlined the results of the combustion ring analysis conducted during 1992-93 in which 10 laboratories participated. The Round Robin consisted of 3 sections: a modified microlithotype analysis and a combined reflectogram and maceral analysis of a pulverised coal fuel (80 % < 75 μm); a char analysis according to a 7-particle classification system based on particle morphology, wall thickness and porosity.

The reproducibility of the results of both the microlithotype and char counts were found to be comparable, and though some standard deviations are high, the results are much improved from last year.

The proportions of various char groups were compared with corresponding microlithotypes in order to determine their origins. A number of general conclusions can be reached:

i. It appears that relics remain from almost all coal particles in the feed coal, and that even vitrite leaves hollow shells (tenuispheres and crassispheres) after combustion at up to 2000°C. Some vitrite and clarite may also form tenui-networks.
ii. Fusinoid and solid chars appear to form from a range of microlithotypes, dominantly semifusite, fusite and inertodetrite, and also vitrinertite-I and durite.
iii. It seems clear that skeletal chars are formed from burnt-out fusite or fusinite-rich particles.
iv. Clarodurite and trimacerite appear to form inertoid chars.
v. Duroclarite appears to be responsible for forming most crassi-network, mixed network and mixed chars.

It was found that the greatest mass contribution to unburnt carbon was made by crassisphere chars (30.8 %) and crassi-network/mixed network chars (34.3 %), whereas tenuispheres contribute 11.0 - 20.7 %, inertoids contribute 4.0 - 7.6 % and solid and fusinoid chars contribute 5.1 - 6.6 % to total unburnt carbon. These results were supported by J. Vleeskens on the basis of his experiments with pulverised coals burned in a 1 MW combustion testing facility (KENA).

It appears that the grinding behaviour of the coal is determined in large parts by the microlithotype content, and this aspect is being investigated further. Some concern was expressed that the number of subdivisions in both the feed coal and char is still too large (Pfisterer). It was also remarked (Vleeskens) that to make a mass balance it is essential to use data that represent mass only. This can be achieved by image analysis or manually by counting solid matter only.

Future work: The Round Robin exercise for 1993-94 will consist of a similar three-part exercise linked with a size distribution of the microlithotypes, using a coal blend which has been combusted at two burn-out levels in a 1 MW combustion testing facility (KENA). These samples will be provided by John Vleeskens.

2.3.3 WG on Coke Petrography - Convener: Denis Vogt

Aim of the working group: To establish a classification of coke textures which is reproducible and which can predict coke-technological properties.

Activities: The convener described the purpose of the exercise in which 12 colour photographs were used in order to identify 33 coke textures according to a scheme that was previously agreed upon. 14 laboratories participated in the exercise which was conducted at three levels:

i. Distinction between isotropic and anisotropic coke matter.
ii. Distinction between fusible and infusible material.
iii. Identification of morphological differences (anisotropy domain size).

A fourth level can be applied in which further subdivision may be made, such as the identification of infusible types.

Good agreement between the participating laboratories was reached at the first and second level. However, considerable disagreement between the participating laboratories was revealed at the third level, i.e. in the identification of anisotropy domains. By using colour slides, these differences were briefly discussed.

Future Work: The meeting decided to conduct another ring analysis after all the outstanding results have been received by the convener. Emphasis will be put on the third level of identification. In addition, a questionnaire will be prepared for the members of the working group to express an opinion on the type of classification to be used.

2.3.4 WG on reactive Inertinite - Convener: Krystyna Kruszewska

Aim of the working group: To evaluate methods for the recognition of fusible inertinite in coal samples, to correlate optical coal with coke analyses, and to produce a definition of reactive inertinite.

Activities: The convener of the working group had prepared a completion report on the activities covering the WG since its inception in 1982 and had transmitted it to the Commission Secretary, Rosa Menendez. In the absence of both the report was read by the Commission chairman, and a limited number of copies were distributed to the members of the working group. In her report, the convener reviews the results of previous ring analyses which generally consisted of a combination of maceral counts, vitrinite reflectance determinations and whole-coal reflectance scans of South African, German and Australian inertinite-rich coals.

The estimates of fusible inertinite were carried out by the method the convener had published in FUEL (1989), supplemented by a small number of estimations done by other methods. Some concern was expressed (Prado) about the applicability of the statistics used in the evaluation of the analysis results, and about the accuracy of the determination of completely fused inertinite by

comparing the inertinite contents of a coke and its feed coal on a volumetric basis (Vleeskens).

The definition of reactive inertinite given by the convener was discussed and it was decided that some editorial work was required. Concern was also expressed (Davis) about a possible conflict with a previous definition of reactive inertinite accepted by the working group at the meeting in Porto Alegre.

Future Work: Although the convener had presented a final report, it was decided not to wind up the working group pending a status report into the whole question of inertinite fusibility estimation and the problem of coke reactivity modelling to be given by the Commission chairman in Oviedo next year.

Abstracts

of papers and posters presented at the 45th Annual Meeting of ICCP at Chania, September 29, 1993

1. Invited Lecture

RESERVES, QUALITY, RESEARCH AND PERSPECTIVES OF GREEK COALS

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Greek coals can be considered as solid fuels of low thermal capacity and cover the range between peat and subbituminous coal.

Among the approximately 70 coal bearing basins which are dispersed throughout Greece 75 % are of Neogene age (Florina, Ptolemais, Amynteon, Elassona and others) 16 % of Quaternary age (Megalopolis, Drama, Peat of Philipi) and 9 % of Eocene-Oligocene age (Orestiada, Alexandroupolis and others).

Lignite exploration started in 1950 with the discovery of the Aliveri deposit which was exploited with underground mining. During the sixties the following lignite deposits were discovered: Megalopolis (Peloponese), Southern Field (Ptolemais) and peat deposit of Philipi in Eastern Macedonia. Following the 1973 oil crisis new lignite deposits were discovered. These are the Anargyri-Amynteon deposit, the Komnina in Ptolemais and the Florina deposit in Western Macedonia and the Drama deposit in Eastern Macedonia.

The quality of Greek lignites is highly variable. Calorific values range from 830 kcal/kg for the lignite of Ioannina to 5.200 kcal/kg for the Alexandroupolis lignites. Moisture content ranges from 62 % for the Megalopolis lignites to 9 % for the Alexandroupolis lignites. Fixed carbon ranges from 40 % for the Eocene lignites of Alexandroupolis to 10 % for the Pleistocene lignites of Megalopolis. Volatile matter fluctuates between 35 % to 11 % for the lignites of Alexandroupolis and Megalopolis respectively and ash ranges from 30 to 45 %.

Lignite ashed at lower temperature (150°C) reveal the presence of quartz, feldspars, layers silicates, pyrite, gypsum, basanite and anhydrides in all samples. Common minerals in the North Central and North Eastern samples are carbonates, metaluminite, hexahydrate, jarosite, epsomite and barite.

High sulphur content is encountered in the samples from northern and northeastern Greece, while the volatilized sulphur is very high in the samples from northeastern Greece (Drama-Orestias). As and Hg are high in coals from northern Greece, especially from Drama. The same is true for U and Se. In southern Greece lignites from Megalopolis, Xidias, Drossato and Vounargo have a high concentration of halogens, indicating an influence of paralic environment or an environment of high salinity. U, Mo, W, are high in the coal ashes from the Drama basin while Ni and Zn are high in coals from the Moschopotamos basin.

Today there are over 6 billion tons of geologically proven lignite reserves out of which 4 billion tons are considered mineable. The deposit of Philipi which has 4.300×10^9 m^3 of peat is not included. 64 % of these lignite deposits are located in the wider area of Florina-Ptolemais-Kozani. The cost of exploration amounts to 1 cent/ton of mineable lignite.

Lignite contribution for power generation was nil in 1950, it increased to 35 % in 1973 and reached 80 % in 1993. Greece satisfies its energy needs through the use of very poor quality coals, that is lignites whose calorific values are around 1000 kcal/kg and ash ranging from 35 to 45 %.

Lignite is used today to feed power stations with a total capacity of 4233 MW, while six additional power stations with a total capacity of 1.800 MW are scheduled for installation over the next ten years.

Bearing this in mind, we should realize that coal exploration and exploitation in Greece is a very challenging undertaking and it is for this very reason that organic petrology and geochemistry, environmental chemistry and other disciplines have a future not so much in exploration but in exploitation.

2. Oral Presentations

PEAT AND PEATLANDS IN GREECE

K. CHRISTANIS

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In Greece, peat forms in topogenous mires (fens) located in intramontane basins, while no fens in paralic environments are known. The fens formed by terrestrialization, i.e. by infilling of lakes, and/or by paludification, i.e. by flooding of flat areas due to the relative rise of the groundwater table. Limnotelmatic to pure telmatic conditions favour the formation of

appropriate biotopes for peat growth. Karst hydrology is an important factor controlling the type and growth of the peat-forming plant communities, as well as, the influx of clastic material into the fen and hence, the type of peatland.

The main peat-forming plants are reeds and sedges; they comprise mainly **Phragmites, Typha, Cyperaceae,** namely **Cladium, Carex, Scirpus,** as well as, aquatic and subaquatic plants. Indices of swamp forests have never been found. Peat accumulation rates in Greek fens during Holocene are similar to those of recent mires in the temperate zone, while during the Last Glacial the rates were similar to the present rates in Arctic mires.

The peat resources of Greece exceed 4 billion m^3. The largest deposits are Philippi, Eastern Macedonia, being famous for its unique thickness (~ 190 m), and Nissi, Western Macedonia. In both, the peat mining and the power generation were planned, but the projects were cancelled due to sociopolitical and ecological reasons.

Small fens all over the country (Koroni, Ioannina, Kalodiki, Katouna, Chotousa, Small Prespa etc.) may be either potential peat deposits and/or important hydrobiotopes. However, the most of them have not been entirely explored and the physical, chemical, and technological properties of the peat have not been estimated yet.

The study of mires offers important information about contemporaneous depositional environments, peat-forming plant communities, peat facies, geological settings, hydrology, physical and chemical parameters, all of which define the character of a mire. Although these data cannot be directly correlated among different geological periods, they contribute to the understanding of the genetic rules, which govern peat accumulation and consequently coal formation.

COAL PETROGRAPHY AND ORGANIC GEOCHEMISTRY OF SELECTED GREEK COAL SAMPLES

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2) Department of Mineral Resources Engineering, Technical University of Crete, Akrotiri, 73.100 Chania, Crete, Greece
3) Lehrstuhl für Geologie, Geochemie und Lagerstätten des Erdöls und der Kohle, Aachen University of Technology, Lochnerstr. 4-20, Aachen, Germany

Coal samples from Florina, Lava, Moschopotamos and Kalavryta, Greece, have been subjected to petrographic and geochemical analysis.

The rank of the samples ranged from 0.26 to 0.42 % Rr. Lower reflectance values were encountered in the Florina and Kalavryta samples while the higher ones in lava and Moschopotamos samples.

Maceral composition of the samples from Florina and Kalavryta have shown high concentration of textinite A and texto-ulminite A which are rich in resinitic material while the samples from Lava and Moschopotamos are rich in humodetrinite. Samples from Florina are rich also in resinite while samples from Lava are rich in liptodetrinite.

Rock-Eval pyrolysis data show that the samples from Florina and Kalavryta have high HI, S_1 and S_2 and low T_{max} values while the ones from Moschopotamos and Kalavryta show the opposite.

Gas chromatography of the saturate fraction indicates that the samples from Lava and Moschopotamos are rich in n-alkanes, the samples from Florina rich in diterpanes and the samples from Kalavryta rich in sesquiterpanes. Gas chromatography-mass spectrometry of the saturate fraction reveals that diterpenoids present in lignites from Kalavryta are derivative of abietanic and pimaric acid which are found in Pinaceae while lignites from Florina contain phyllocladane/kaurane and sclarane which imply input from Cupressaceae. The difference between these two xylitic types of lignites is attributed to that the Florina coals are of Miocene age while the Kalavryta coals are of Pliocene age. The climate changes from warm/subtropical to cool temperate within this span.

With respect to changes in environment of deposition the study concludes that different source inputs were involved in the various basins. A mainly non woody, angiosperm dominated input made up the peat which went to form the coal deposits of Lava and Moschopotamos while the Florina and Kalavryta lignites were formed by peats derived from gymnosperm plants.

PRELIMINARY RESULTS ON ORGANIC PETROLOGY AND GEOCHEMISTRY OF LIGNITES FROM THE AS PONTES BASIN (NW SPAIN)

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This study deals with the petrographical and organic geochemical features of a coal deposit in the small scale fault bounded As Pontes basin of Tertiary age (Galicia, NW Spain). The basin is about 7 km long and 1.5 up to 2.5 km wide, extended parallel to the NW-SE orientated strike slip fault systems present. The basin was fed by two alluvial systems, one located at the northern margin of the basin, the other more relevant one for the basin infill on the eastern margin. The areal extend and distribution of the sediments supplied by the two systems, changed significantly during the successive evolutionary stages of the basin. The basin infill consists of terrigenous-alluvial sediments (mudstones, sandy mudstones arkosic sands, sands and quarz angulose gravels), including several workable coal seams. This complex geological conditions resulted in large variations in the composition of the coals of this basin.

According to the huminite reflectance (measured on ulminite B) of 0.31 % to 0.39 % (Rr) and a mean calorific value of about 15,000 j/g (moist, af) the coals

can be classified as lignites B (ASTM). The coals are mineral rich (with ash contents from 13 % up to 40 % (d.b.).

Macropetrographically the coals are more or less homogenous and can be classified as matrix coals and/or mineral-rich coals. They are non or moderately stratified, the stratification is caused by small plant tissues of varying colour. Large plant organs are not present. Especially eyecatching are some pale yellow layers, whereas the coals of As Pontes in general are medium to dark brown according to their degree of gelification. The pale yellow coals are either enriched in lipid-rich plant constituents (e.g. cuticles, cork tissues) and/or mineral matter (especially clay).

Microscopically the coal's dominant maceral group is huminite with varying amounts of humotelinite, humodetrinite and humocollinite. Inertinite in general is rare and occurs enriched in small fusain layers only, mainly as inertodetrinite. The main liptinite macerals are sporinite and liptodetrinite. Cutinite, fluorinite, suberinite and resinite are also present in small amounts. The quantity of liptinite is related to the amount of mineral matter. This is in good agreement with the findings of the macroscopical analysis, in which bright, mineral rich coals are described to be the richest in lipid-rich plant constituents. The liptinite content in this bright coals can reach up to 17 % (mmf). By calculating the TPI (tissue preservation index) and the GI (gelification index) from the maceral analysis data, it can be concluded that the depositional environment of the basin was generally getting dryer from the bottom to the top of the sequence.

The quantity of bitumen extracted from the coals is extremely variable. The variations are caused by different degrees of gelification and mainly by the mineral matter content (by which the bitumen mobility and thereby the extractibility is increased). In the aliphatic fraction of some coals, indications for algal influence are found. Hopanes in all the coals studied indicate bacterial influence. The occurrence of only small amounts of diterpenoids characteristic for gymnosperms supports the idea, that angiosperms are the major contributors to the original plant material.

Summarising the results, it can be seen that the complex sedimentary conditions of this basin cause large variations in the coal's composition, mainly due to changing water levels and different degrees of degradation.

L'ETUDE PETROGRAPHIQUE ET PHYSICO-CHIMIQUE COMPARATIVE DE GISEMENTS DES CHARBONS DE ROUMANIE

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L'ouvrage présente les caractéristiques chimico-techniques et pétrographiques de quelques échantillons représentatifs de charbons roumains le long de toute échelle d'houillification. Les aspects detransformation évolutive du matériel organique, pendant l'augmentation du rang (en Roumanie il y a des charbons à R Huminite/Vitrinite, 0,08 - 7,51 %, respectivement de charbon brun à méta-anthracite), sont mis en évidence, comparativement par ceux de la présence et du changement du matérial minéral (des charbons et des roches stériles-des grès, des argiles, etc.).

On a employé une méthodologie complexe de détermination qui comprend des analyses chimico-techniques (analyse immédiate et élémentaire, pouvoir calorifique, thermodifférencielle, röntgénostructurale, etc.) et physiques (pétrographiques en lumière naturelle transmise et reflétée et en lumière fluorescente). On a évidendié la relation existente entre les transformations pendant l'houillification (lepassage graduel de l'huminite en vitrinite, la disparition du liptine, l'apparition des produits carboniques néoformés-coke, pyrocarbon, semigraphite, graphite) et celles des minéraux de roches associées (la recristallisation du quartz détritique, des carbonates, du pyrite, la transformation des micas en hydromicas, des feldspaths en carbonate, en kaolinite, en quartz, des pyroxénes et des amphiboles en chlorite, etc., la présence et le degré de cristallinité de l'illite, l'apparition du pyrophyllite, du chloritoide, du pyrotite, du chalcopyrite, du cubanite, de l'hématite, etc.). On mentionne aussi l'age géologique, les classifications chimico-technologiques des charbons et des lithotypes, les stades de diagénèse et/ou d'anchimétamorphisme des complexes charboneux. L'étude suggère la possibilité d'un abordage unitaire des transformations de phase macérale/minérale, en contexte géologique, de la matière organique et inorganique des gisements étudies. Nous demontrons dans les gisements d'houille faible et d'anthracite (Baia Noua, Pregheda-Chiacovat-Ostresu) et de méta-anthracite (Armenis-Raul Lung-Raul Alb et Schela-Gorj) une bonne corrélation entre les caractéristiques physico-chimiques du matériel organique (RVI = 1,60 - 7,51 %, $M.V.^{mc}$ = 20,35 - 0,7 %, C^{mc} = 88,35 - 98 %, H^{mc} = 4,41 - 2,00 %, O^{mc} = 7,07 - 0,2 %, $TOMMOS^3$ = 34° - 65°C, le peak pour le plan basal du graphite /0002/ = 3,66 Å - 3,48 Å, etc.) et le degrée de cristallinité del'illite (la sémidistance relative a l'hauteur de peak 10 Å = 9 - 3 mm), la formation d'autres minéraux épigénétiques (quartz, calcite, pyrite, pyrotite, chalcopyrite, cubanite, hematite, pyrophyllite, chloritoide, rutile-anatas), etc. On présente les substitutions du résinite et du sporinite par le pyrite, de la calcite, par la calcedoine et le pyrite, de l'huminite par la calcedoine, le quartz, la calcite et le pyrite, de l'huminite par la calcedoine, le quartz, la calcite et le pyrite et du vitrinite par la calcite, le quartz et l'illite etc.

ORGANIC MATURATION OF SILURIAN SEDIMENTS FROM BARRANDIAN AREA, CZECH REPUBLIC

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Shales and limestones of the Pridoli Formation, Silurian, of the Barrandian area, south-west from Prague, were studied by organic petrology to determine their organic maturation level.

The Pridoli Formation was chosen because of the great variety of organic matter types, no contact metamorphism, possibility to compare the organic maturation with the diagenesis level determined by other methods (illite crystallinity, fluid inclusions etc.) and occurrence of dolomites on the Silurian/Devonian boundary.

The following types of organic matter were microscopically determined using polished sections: grained organic and organic-mineral matter, primary and secondary bitumen, vitrinite, inertinite, liptinite, graptolite and chitinozoan fragments, faunal relics formed by organic matter, graphite.

The reflectance in oil immersion was measured for all types of organic matter. Vitrinite reflectance as the most significant maturity parameter varied in the range 0.93 % Rm to 1.38 % Rm.

Some organic particles showed brown fluorescence. Anhedral to subhedral zonal crystals of dolomite, of brown to orange fluorescence, occurred in the shales, in some parts concentrated in lenses or layers. Some calcite grains contained small inclusions of yellow, yellow-green or orange fluorescence, which could be interpreted as oil droplets.

It follows from the observations that the organic maturation of the Pridoli Formation sediments is in the lower part of the oil window overlapped by the upper parts of wet and dry gas zones.

PALEOFLORAL AND PALEOCLIMATE INFLUENCES ON THE PROPERTIES OF CRETACEOUS AND EOCENE NEW ZEALAND COALS

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Classification of New Zealand coals, based on crossplots relating vitrinite chemistry and plant tissue preservation, defines distinct fields for vitrinite dominated coals of different ages. In particular, middle Eocene coals (45 Ma) have very poor tissue preservation, and a hydrogen rich vitrinite chemistry, compared with latest Cretaceous (70 Ma) coals. The intermediate characteristics of relatively young coals (40 to 20 Ma) suggest that progressive evolutionary changes in plant chemistry were not the primary influence on variation in peat characteristics. Depositional regime is also discounted as the principal control, because a full range of marginal marine to fluvial and lacustrine environments is represented by coals of both latest Cretaceous and middle Eocene age.

Fossil pollen assemblages from fluviatile, low ash middle Eozene coals (several coalfields) are diverse and angiosperm dominated. In contrast, fossil pollen from fluviatile, low ash late Cretaceous coals (Ohai Coalfield) exhibit low diversity and strong gymnosperm dominance, even though contemporaneous floodplain sediments and mineral rich coals yield diverse, angiosperm dominated pollen and macrofloral assemblages. Folia physiognomic analysis indicates that the latest Cretaceous and middle Eocene paleoclimates were micromesothermal (cool to mild temperature) and megathermal (> 20°C Mean Annual Temperature) respectively. The distinctive characteristics of middle Eocene New Zealand coals are therefore attributed to dominance of more flora by an angiospermous community, in response to unusually warm climatic conditions. Modern tropical mires and attendant peat characteristics are not clearly analogous, because the monocotyledonous plants which are now important elements are poorly represented in the New Zealand Eocene fossil record, and may never have been a significant part of the flora.

Further evidence that floral assemblage may be a key influence on eventual coal chemistry and petrology is provided by an unusual latest Cretaceous coal from Drillhole 633 at Greymouth Coalfield. Other coals from the same seam horizon have a typical Cretaceous aspect, but the Drillhole 633 intersection has anomalously high hydrogen and strongly suppressed vitrinite reflectance, grossly divergent from general latest Cretaceous trends. The coal contains abundant pebbles, and because the overall ash content, inclusive of pebbles, is less than 3 % (dry basis), the pebbles are interpreted to have floated in attached to the roots of drifting logs. The paleogeographic position of the site in an isolated arm of a large lake suggests that the deposit may predominantly comprise floodplain vegetation which has entered the lake during flood events and drifted into a low energy backwater. Given palynological and paleobotanical evidence that floodplain floras in the New Zealand latest Cretaceous were angiosperm dominated (para 2), the anomalously hydrogen rich chemistry of Drillhole 633 coal could be attributable to an angiosperm origin, as proposed for the middle Eocene coals.

VITRINITE REFLECTANCE GEOTHERMOMETRY ON GREEK GEOTHERMAL FIELDS

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The method of vitrinite reflectance of dispersed organic matter has been applied to samples of sediments from Greek geothermal fields. Our goal has been to determine the degree to which certain thermal events have affected the maturity of the dispersed organic matter and when possible to estimate the present geothermal gradients.

The samples originated from two different geothermal sites of Central Greece, the Tertiary-Quaternary Spercheios River Graben and the Methana peninsula, which lies close to the intersection of the Corinthiakos-Saronikos Graben with the northwestern edge of the Aegean Active Volcanic Arc.

For the Spercheios River Graben results indicate that there is a systematic trend of increase of the vitrinite reflectance values parallel to and in the vicinity of the system of large normal faults which have formed this

graben. A systematic increase of the R_r of 0.25 to 0.40 % has been detected with values ranging from 0.45 to 1.12 % R_r in the northern part of the basin and 0.72 to 1.38 % R_r in the southern part. It can be concluded that the large fault systems have facilitated the influx of extra heat flow leading to an overall increase of the geothermal gradient in the surrounding region. The reflectance data coupled with other geological information lead to an estimate of the present geothermal gradient at 36 to 38 °C/km.

In the case of the Methana peninsula region only a slight increase of the vitrinite reflectance towards the north of the area under investigation has been identified. The values of vitrinite reflectance of the dispersed organic matter vary from 0.45 to 0.65 % R_r, the higher values being detected in the northern part. This slight increase in the degree of organic metamorphism among these sediments, can be attributed either to the rather short geologic period of extra thermal activity (since the Pliocene) which affected these sediments or to the distance of the region of study from the center of the proposed Pliocene to present thermal-volcanic event.

DEVIATING VITRINITE REFLECTANCE VALUES IN A CARBONIFEROUS COAL SEQUENCE FROM THE NETHERLANDS

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An Upper Carboniferous coal's sequence has been analyzed by means of organic petrological and organic geochemical methods. The fully cored sequence contains fourty-five coal seams. A number of samples show vitrinite reflectance values with significant deviations from the general vertical coalification trend. The sedimentological analysis of the sequence has resulted in a correlation between these reflectance data and the sedimentary history of the coal seams. Coal seams overlain by sandstone units have significantly lower reflectance values than those with a roof consisting of shales. The hydrogen index (HI) values reveal that those seams with suppressed reflectance values have significantly higher HI values which deviate from the general trend as established for the Westphalian coals from the Netherlands. Detailed maceral analyses have been selected on the basis of their vitrinite reflectance value and sedimentological setting.

In order to test the hypothesis of (paleo) environmental control on deviating vitrinite reflectance values, a non-linear multiple regression analysis is currently being performed on these data. Expected reflectance values are derived from modelling the thermal history of the coal sequence by applying a kinetic model for vitrinite maturation. These values are compared to factors such as measured reflectance values, sedimentary facies, maceral composition, and hydrogen index using statistical methods.

OPTICAL CHARACTERISATION OF COAL BY MEANS OF COLOUR IMAGE ANALYSIS

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Colour Image Analysis (CIA) Systems are capable of processing multi-colour images. Thus it has become possible to define more complex optical units in comparison to black and white image analysis. In this study CIA is applied to organic petrology. The colour composition of each maceral group can be defined by the intensity levels of three different colours, i.e. red, green and blue. The system used (CUE 3, OLYMPUS) is able to distinguish more than 16 million colours. The determination of the upper and lower limits of the intensity levels of the three colours components (threshold setting) is the most crucial step in CIA since the heterogeneity of macerals often causes an overlap in colour composition of the maceral groups.

Previous investigations revealed that CIA, arried out by one operator, is competitive to conventional point count analysis (PCA) as performed by several operators. Since threshold setting is the most subjective step in CIA, an experiment was designed to test the reproducibility of CIA performed by several operators. A set of coal samples of different ranks from the Carboniferous Coal Measures of The Netherlands was selected for analysis. Four different operators are currently performing threshold setting and volume fraction analyses, as well as PCA. Preliminary results indicate that the reproducibility of CIA is comparable to conventional point count analysis. Advantages of CIA are a more objective treatment of analysis and time efficiency.

NEW TRENDS IN THE AUTOMATIC PETROGRAPHIC ANALYSIS OF COAL

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A new approach is being developed to perform automatic maceral and reflectance analysis of single coals. Until now a classical approach for automatic reflectance has been the construction of a global histogram and the deconvolution of vitrinite peaks by statistical methods. For maceral analysis, the results are based on grouping the image pixels, after digitalization of the analog video signal, by grey levels, making the distinction between macerals by establishing the separation values.

In this new approach the main and most innovative idea is to combine an expert system with an image processing system to reproduce the analysis procedure followed by a human expert when performing the same task. The system is composed of three interconnected modules:
- Expert system
- Image processing system
- Management system

The expert system goal is to imitate the reasoning procedure of a coal petrography expert when doing a maceral analysis, assuming that he is not able to watch the image at the microscope but can instead ask questions to an observer watching it. These questions are answered by a specialized image processing system that is able to answer a pre-established set of acceptable inquiries.

The management system controls system's hardware and interfaces to the expert system and to specialized image processing system, as well as to the human operator.

The main results obtained until now are
- Hardware and software design of the system
- Development of the expert system
- Development of a library of high and intermediate level functions for image processor utilization and control, as well as package of basic utility programs for image processing and applications development.
- Partial development of a set of specialized image processing functions to answer the questions of the expert system.
- Complete control of the automatic focus, x/y coordinates of the stage, partial histogram of the field of interest and delimitation of three especial zones, A, B and C, that are the key to the decisions to be taken by the image processing system.

THE CONTRIBUTION OF TRANSMITTED LIGHT AND UV-LIGHT MICROSCOPY ASSOCIATED WITH VITRINITE REFLECTANCE AND PYROLYSIS (TMAX) TO A BETTER APPROACH FOR THE ASSESSMENT OF THE MATURATION OF DISPERSED ORGANIC MATTER

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Vitrinite is the most widely used tool for measuring maturity of organic matter bearing sediments. Although it is one of the most quantitative methods to evaluate the degree of thermal evolution it has many intrinsic limitations when applied for dispersed organic matter. In order to find out the indigenous population of vitrinite in a sample it is important to integrate all the information available such as UV- and transmitted light techniques as well as Pyrolysis Rock-Eval Tmax.

Samples from wells of Tucano Basin, northeastern Brazil, were studied in order to check the onset of oil generation. The Tucano is a rift basin, comprising sediments from Devonian to Aptian age.

Organic petrography studies carried out in samples from this basin very often display a wide range of vitrinite phytoclasts. In this case the major problem is the significant amount of recycled vitrinite. The studied well provided a good example of the wide range of vitrinite reflectance measurements. Although measuring only vitrinite phytoclasts that better represent the indigenous population, the utilization of these results without any other maturation approach could probably characterize mistakenly the oil window.

Plots of vitrinite reflectance versus Tmax from pyrolysis can indicate the temperature of the onset of maturation for a basin. The vitrinite versus Tmax plot obtained for an area of Tucano Basin presents a good correlation between these two maturity parameters pointing out that 441°C may indicate the onset of oil windows. Results from SCI, vitrinite reflectance and Pyrolysis Tmax point out that the organic matter reached the onset of maturation at about 2800 m depth. Spectral fluorescence measurements present a good correlation with vitrinite reflectance, SCI and Pyrolysis Tmax.

A NEW METHOD TO FORECAST MECHANICAL PROPERTIES OF COKE BY COAL PETROGRAPHIC ANALYSIS

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On the basis of the experiences and knowledge of the Laboratorio Materie Prime (Raw Material Laboratory) about the prevision of mechanical qualities of coke, ILVA-CSM (Centro Sviluppo Materiali) has developed a new method; it is based on the calculation of the CBI (Composition Balance Index) and the SI (Strength Index) derived from petrographic maceral and rank analyses and allows to calculate, by statistic elaboration, the M40 coke index. The method considers 100 coals of various origins (USA, Russia, Australia, Poland, Canada, Germany), with volatile matter from a minimum of 17 % to a maximum of 38 %; the coals chosen for this study cover the whole range of coking coals (even the intermediate rank ranges). Experimental checking of the values has been carried out in a pilot oven with an 18" chamber and a capacity of 300 kg of coal. The CBI and SI vary respectively between 0.228 - 2.880 and between 3.220 - 6.898. After determining which kind of dependence exists between the two indices and the M 40 coke index, two formulas (LMP1 and LMP2) have been developed, based on advanced statistical techniques for non-linear interpolation. It is important to put the attention on the main characteristic of these formulas: they allow to forecast the M 40 coke index without considering the Stability Factor; the correlation indeces R between the calculated and the real value are 0.837 (LMP1) and 0.849 (LMP2), which allow to explain more than 70 % of the variability. The method does not show any tendence to over- or underestimate the values.

NUMERICAL MODELLING OF REFLECTANCE OF COKING COALS

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Automated petrographic systems are designed to rapidly acquire reflectance measurements of coal macerals without the presence of an operator. However, the subsequent interpretation of these reflectance data have been hampered by poor data-quality and limited by a need to refer to traditional petrographic terms.

Most coals are mixtures of two types of material, namely vitrinite and inertinite. The distribution of vitrinite reflectance follows a gaussian distribution, while that of inertinite follows a gamma distribution. By combining these distributions in various amounts, and changing the parameters which define them, the reflectance distribution of any coal can be modeled numerically with precision. Natural coals with vitrinite contents from 100 % to 25 %, inertinites of 0 % to 75 %, and vitrinite reflectances from 0.5 % to 1.7 %, have been modeled using this technique. Fuzzy logic is then used to predict coke strength directly, without reference to traditional parameters.

Application of the technique is ideally suited to quality-control situations where large numbers of similar coal samples are to be examined. It also allows non-petrographers to interpret reflectance data and to determine petrographic parameters of interest to coal producers and coke plant managers. Analysis time for a single coal is about 1 minute, while blend proportions take about 2 minutes to determine.

RELATIONS BETWEEN SPECIFIC STRUCTURAL CHARACTERISTICS OF ROMANIAN COALS USED IN COKEMAKING INDUSTRY

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The paper presents the maceral composition and rank characteristics of Lupeni and Anina coals. The different quality of Lupeni and Anina bituminous-coals is typical of Romanian coals used in cokemaking industry.

Studies of the chemical composition, structure and petrographic components of Lupeni low-rank coals and Anina medium-rank coals confirmed the contrast between them, due to the original material and its transformation during coalification.

High-vitrinite content over 80 %, lower rank 0.7 - 0,75 % R_r, inertinite below 1 % and petrographic heterogeneity are special features of Lupeni weakly coking coals. Macerals of the vitrinite group (collinite, desmocollinite, telinite), are present and also the high content of liptinite and bituminous fluorescent substances (telinite with resinite) which cause the increase of the volatile matter content.

The coals of Lupeni, washed below 10 % ash (df), have about 40 % volatile matter (daf). For this coal, the microlithotypes clarite and vitrite assure an inadequate plastic phase, making a coke of poor quality.

In contrast with Lupeni coals, Anina coals are rich in inertinite, about 30 %, with a vitrinite content of about 33 %. For these coals, the main vitrinite maceral is collinite, coalified to 0.9 - 1.0 % Rm. Anina inertinite contains about 2/3 semifusinite and from it almost 30 % has a low reflectance, very closed to that of associated vitrinite. These particular properties deeply influence the physico-chemical and technological behaviour of the coking process.

3. Posters

COAL STRUCTURE CHARACTERIZATION AND ANALYSIS BY DIGITAL TEXTURE PROCESSING

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The design of a suitable strategy able to reach a valorization of fossil fuels by microorganisms is obviously based on a quantitative characterization of the different macerals constituting the coal. Coal is not a homogeneous substance, but consists of different constituents called macerals, each one characterized by its own set of physical properties, chemical composition and geometry. Macerals differ from mineral constituents of rocks because they do not have a well defined chemical composition and physical properties, and they are not crystalline thus recurrence and distribution of macerals play a decisive role in the valorization. The purpose of this poster is to describe the use of digital processing techniques based on the analyses of sample images to characterize coals taking into account the reflectance of macerals. Their reflectance-textural characteristics were recognized, analyzed and a modelled pattern vector was identified for each one. The procedure is based on the data acquired by means of an optical microscope using reflected light on polished specimens of coal cores.

PTOLEMAIS AND MEGALOPOLIS BROWN COALS: COMPOSITION AND PROPERTIES

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Ptolemais and Megalopolis coals are a primary national resource of Greece being utilized to produce about 80 % of the electrical power needed by the country. Though being a poor quality fuel, at present they cannot be replaced with less expensive and less hazardous sources of energy. However, a better knowledge of their composition and properties may help in facing problems related to their use.

Petrologic, chemical and technological analyses have been done to define both rank and quality of the above coals. Their rank has been determined by measuring the reflectance on the most abundant maceral eu-ulminite B. All studied samples may be referred to the coalification stage of brown coals.

Chemical analyses show high moisture, high ash content, and relatively low calorific values. Because of high

sulphur content, particularly in Megalopolis lignite, the use of suitable filtering devices should be recommended.

Technological tests revealed a medium to low quality. Because of the low Hardgroove index, special care in grinding operations should be taken, in particular for the Megalopolis lignite. Flow temperatures of ashes are relatively high so that no problem should arise if burning conditions will not changed.

OXIDATION EFFECTS ON MACERALS OF THE CANDIOTA COAL, RIO GRANDE DO SUL STATE, SOUTHERN BRAZIL, STOCKED IN PILES

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Run-of-mine coal from the Candiota seam was stocked in piles open to the atmosphere for 10 months.

Reflectance measurements on vitrinite, fusinite, semifusinite, sclerotinite and macrinite, proximate analysis, and calorific value determinations were carried out on samples collected monthly as well as on samples of the run-of-mine coal. The content of ash, sulphur and volatile matter presented no significant variation, except for the densimetric range of -1.60 g/cm^3 of the size fraction < 0.59 mm, in which the ash content increased. This phenomenon may be related to the desintegration of the coal particles observed under the microscope.

The calorific value decreased during storage from 29.018 j/g to 27.402 j/g what represents a loss of 5.6 %. Reflectance varied slightly and differently in the distinct macerals. There was a decrease of the reflectivity of vitrinite and macrinite and an increase of that of sclerotinite; whereas fusinite and semifusinite varied randomly.

The formation of fissures was observed both inside and surrounding the particles of vitrinite and inertinite macerals.

LIGNITES FROM THE WEISSELSTER-BASIN

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In this study data from organic-petrographical and organic-geochemical analyses are presented from lignites that were sampled in the Weißelster-Basin, a deposit of the West-Elbian mining area. The coals are of Upper Eocene age.

Dark and bright lithotypes were studied. It is shown that the lignites differ significantly in their degree of gelification and degradation. Whereas the bright coals are mainly characterized by high amounts of humodetrinite and higher ash contents, the dark lithotypes are highly gelified and contain high amounts of non destructed tissues. This difference can also be related to varying extract amounts and the fluorescence characteristics of the extracts. A bacterial influence on the degradation is confirmed by high amounts of hopanoids detected in the extracts of the bright coals.

Whereas the differences in this coals can thus mainly be attributed to varying depositional conditions the dominance of angiosperm related original plant matter in all the coals studied, is demonstrated by characteristic terpenoids distributions detected in the aliphatic and in the aromatic fractions.

ENVIRONMENT OF DEPOSITION OF TERTIARY THAI COAL: COAL PETROGRAPHIC IMPLICATION

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The deposition environments of Tertiary coals from Thailand are divided into two categories (1) Normal coal-bearing formation and (2) Catastrophism-related coal formation.

The first category of coal- bearing formations is mainly of lacustrine littoral deposits and forest swamp-lacustrine environment of deposition. The coals are characterized by gelinite and densinite with the presence of sclerotinite, and occasionally semifusinite and fusinite. Alginite is commonly associated, both lamalginite and Botryococcus-related forms occur. Liptinite is mainly cutinite, resinite and in some cases, sporinite. Mineral matter is mainly disseminated pyrite and clay. The appearance are typically wet or high-water-level associations.

The second category is dominated by texto-ulminite and suberinite. Thick layers of pyrite or pyritization along the cleats and voids are commonly found. Tree trunks buried in coarse-grained sediments mainly muddy, gravelly sandstone, confirmed the strong current of transportation. Leave layers associated with the coal bearing formations could indicate the type of catastrophism, and could be typhoon. The forest could be firstly destroyed by strong wind, carried and deposited stripped leaves, followed by strong flooding which carried and deposited the fallen tree trunks. In some cases, volvanic activities could play the important roles.

PEAT-FORMING ENVIRONMENTS OF THE PERMIAN GONDWANIC SOUTH BRAZILIAN COALS

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The south Brazilian Gondwana coals occur as isolated deposits associated to the sedimentary rocks of the Tubarao Group, Lower Permian, of the Paraná Basin, which is situated in the central-eastern portion of South America.

On the basis of macerals, microlithotypes and palynological analyses, it is possible to determine the coal facies and swamp-types as well as the lateral and vertical facies changes of the coalfields.

In general, the south Brazilian coals are characterized by a high amount of clay minerals, carbargilite and trimacerite.

Liptinite macerals, either sporinite or alginite, are also abundant. These coal seams are supposed to have been formed mostly under subaquatic conditions that enhanced the deposition of inorganic matter along with plant tissues derived mainly from pteridophytic vegetation. Lignocellulosic material was transformed during the peat-formation process into gelo- and desmocollinite, frequently impregnated by lipids.

The coal facies formed in these environments presents a rich micro floristic association with predominance of spores related to PTERIDOPHYTA (*Punctatisporites, Lundbladispora, Cristatisporites, Vallatisporites, Calamospora, Horriditriletes)* and subordinate GYMNOSPERMAE pollen grains (*Potonieisporites, Caheniasaccites, Plicatipollenites, Protohaploxypinus, Vittatina*) ALGAE (*Botryococcus*) and algae-like elements (*Portalites, Tetroporina*). The megaflora is also represented by a pteridophytic association within which remnants of Glossopteridophyta, Cordaitophyta and Coniferophyta can be found.

The Charqueadas coal basin, in the State of Rio Grande do Sul, is a very good example of such changeable environment conditions characterized by both lateral and vertical organic facies changes.

PETROGRAPHIC, CHEMICAL AND TECHNOLOGICAL CHARACTERIZATION OF SULCIS COAL (SARDINIA, ITALY)

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Because of the great import of energy, Sulcis coal is in Italy a very important power resource for its good energy contents and for the coal-field extension.

The poster deals with the results of a petrographic, chemical and technological investigation carried out on productive seams. On the basis of measurements of the average reflectance on the maceral vitrinite correlated to the specific calorific value (m, mmf), the Sulcis coal has been defined as sub-bituminous coal (ASTM).

The maceral composition determined for the coal indicates that vitrinite ranges from 50 to 83 % (average 71 %), exinite from 10 to 24 % (average 13 %) and inertinite from 2 to 15 % (average 5 %). The mineral phases are mainly constituted of carbonates (dolomite and calcite), prevailingly present as fillers of microfractures and shrinking microfissures of macerals of the vitrinite group, and sulfides (pyrite and marcasite) essentially syngenetic and finely intergrown within the coal matrix. In all the samples analyzed, the content of organic sulphur was particularly high (in average 60 % of total sulphur). The organic sulphur content of the various macerals has been studied using the electron microprobe.

The poster reports the results of chemical (proximate, ultimate, etc.) and technological (calorific value) analyses correlated to the results of petrographic analyses.

The conclusions of the work indicate that Sulcis coal is not suitable for pre-combustive processes. In fact physical methods of desulphurization are practically ineffective, while chemical and biological techniques are yet too expensive. For its utilization the prospect of gasification have been recently considered on the basis of a feasibility study.

Book Review

Petrografia carbunilor, cocsurilor si produselor carbonice (Petrography of coal, coke and carbon products) by Cornelia Panaitescu (1991), 323 p., 260 fig., 70 tabl. Editura Enciclopedica, Bucuresti.

This book addresses as well organic petrologists as technologists.
The book is divided into four chapters as follows:

Introduction
1. Coal petrography
2. Coke petrography
3. Petrography of carbon products
4. Industrial application of carbopetrography

Chapter 1 deals with the coal petrographic composition and coal rank determination of different Romanian coals, the physico-chemical and structural composition of the coals during the coalification process, and the rank variation in Romanian coal fields. Shale petrography and determination of organic matter in sedimentary rocks is also included.

Chapter 2 contains a description of the structural transformation of coal by pyrogenous processes, coke petrography and the relationship between coalification and carbonization.

Chapter 3 gives an overview of carbon product's structure and commercial quality requirements. The petrographical analysis of raw, roasted and graphitizated carbon products is added.

In chapter 4 the domains of the practical application of carbopetrography are given.

Numerous references (completed by an author index) and almost 600 micrographs increase the value of this book.

The selection of many examples from different petrographical domains due to the author's experience, are an interesting source of information especially for those who want to know more about applied coal petrography in Romania.

For the technologists this book contains much information about how to use the petrographical results in practice, for geology and mining, combustion and gasification, coke making, carbon products and sedimentary organic matter.

This book is a good contribution to the classical textbooks dealing with organic petrology.

Georgeta Predeanu, Bucuresti-Romania

Meetings

COAL SYMPOSIUM (GSA Annual Meeting, Boston, MA, October 25-28, 1993)

A symposium entitled "Coalification: Metamorphic Parameters and Interpretations of Maturation Histories" - which will be chaired by Alan Davis (Penn State) and P. Lyons (USGS) - will focus on the use of both organic and inorganic parameters to decipher the organic maturation and coalification histories in various coal basins of North America. Time-temperature modelling will be a fundamental component of some of the papers. Various thermal indicators such as geochemistry, conodont coloration, graptolite reflectance, vitrinite reflectance, optical fabrics, metamorphic minerals, presence of liptinite group macerals, and other parameters will be used to evaluate the coalification, tectonic, and thermal history of complex coal basins. These include the Anthracite region of eastern Pennsylvania and the Narragansett basin of Massachusetts and Rhode Island, which contains both low-sulfur anthracite and meta-anthracite. These papers have applications to coal quality and utilization and to the generation of oil and gas deposits in North America.

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