

Minutes of ICCP Commission II
Geological Applications of Coal and Organic Petrology
72nd ICCP Meeting
Prague, 20th-25th September 2021

Chair: Jolanta Kus, J.Kus@bgr.de

Secretary: George Siavalas, Georgios.Siavalas@shell.com

Wednesday – 22nd September

The Commission II meeting started on Tuesday September 22nd at 09:00am (local time) both at the facilities of the Czech Academy of Sciences in Prague and virtually through a zoom call. Both the Chair and Secretary of the Commission were connected to the meeting online. The meeting was attended by a total of 36 persons, 11 of whom were in the meeting room and 25 were connected online.

09:00 – 09:30 - Opening address – Jolanta Kus & George Siavalas

The Chair of Commission II opened the session describing the structure, objectives and deliverables from the activities of the Commission. The Chair also presented Commission's II Programme during the 72nd ICCP Meeting and gave a short description of objectives and activities of the active working groups. Jolanta Kus also encouraged members to actively join the existing Working Groups and made a call for proposal of new Working Groups. The Chair demonstrated an update of Commission II webpage, where a new section including the full minutes of Commission II meetings over the past 10 years was added. Another section containing personal information on new members of Commission II was also intended to be added but it was eventually decided to be put on hold until it is decided if and how the information of new member is posted in a different part of the ICCP webpage. The Chair also showed the available training material under Commission II and stated that the material sits with Nikki Wagner, the ICCP editor and requests should be submitted to her through e-mail.

09:30 – 09:45- Pseudovitrinite WG – Jolanta Kus on behalf of Lila Gurba

Lila Gurba was not able to join the online session and communicated a short memo to report a progress update to the Commission. Jolanta Kus presented the main points of the

document focusing around the three main deliverables of the WG. 1. Bibliography of published papers and unpublished reports and data. The 1st draft is completed and will be accessible from the ICCP website. 2. Atlas of pseudovitrinite photomicrographs. The Atlas is completed and will be uploaded to the ICCP website. 3. Scientific publications. a) A paper titled “*Pseudovitrinite - An appraisal of the work carried-out by the International Committee for Coal and Organic Petrology (ICCP)*” co-authored by Gurba, Smith, Kwiecińska and others to be submitted for publication in Int. Journal of Coal Geology. The 1st draft is completed and following a review from ICCP members it is planned to be submitted before the end of 2021. b) ICCP Handbook (White Paper). The 1st draft co-authored by Gurba, Kus and Misz-Kennan is completed and will be circulated among the WG members for input and review. It will be submitted to the Int. J. of Coal Geology for publication.

The convenor also provided a summary of activities during 2020-2021, which included an update of the ICCP website of Commission II activities to include Pseudovitrinite WG, the preparation of a document containing a historical record of all activities in this WG, and uploading of all progress reports and historical documents to the WG website. Tasks expected to be completed in 2021 include uploading of the Atlas and circulation of draft papers for review.

Discussion:

Angeles Gomez Borrego acknowledged the convener's hard work and efforts in preparing a large volume of documents. She also commented that the term pseudovitrinite is not an approved term by the ICCP and that should be taken into consideration when approaching the review of the Pseudovitrinite Handbook (White Paper). In the absence of the convenor the discussion did not continue. The chair and secretary agreed to organize a call to debrief the convenor on what was discussed and agree on the next steps.

Commission II thanks Lila for her hard efforts in compiling the material for the Pseudovitrinite WG.

09:45 - 10:10 – Confocal Laser Scanning Microscopy WG– Convenors: Paul Hackley & Jolanta Kus

Paul Hackley presented the Final Report of this WG during the Meeting. The convenor presented the history of the WG and stated that after video meetings between the convenors and no interest from the members of the WG to carry on with further activity a decision was

made to finalize all activities and close the WG after the end of 2021. He then presented the details of the sample used for the last exercise, which is a sample from the Kimmeridge Clay Formation (KCF, UK) with 44 wt.% TOC and 0.42% V_{Ro}. The sample is rich in bituminite and solid bitumen, also containing vitrinite, inertinite and macrinite together with sulphides. Before the application of CLSM the sample was characterized applying Atomic Force Microscopy after broad ion beam-milling. Results showed that BIB-milling increased the reflectance of components and also induced surface roughening because of differential milling based on hardness of organic matter, nano-sulphides and quartz. More work is required to understand the distribution of post-milling properties on the surface of the specimen. The demonstration of 3-channel false colour images acquired applying CLSM assisted in the identification of *Botryococcus* alginite in a rock formed in the marine domain as well as replacement of Fe by U in sulphides. An observed red-shift of both reflectance and fluorescence was attributed to below surface sulphides and blue-shift of reflectance was attributed to photooxidation of amorphous organic matter. Spectroscopy results revealed that the empirical relationship proposed by Stasiuk (1994) matches λ_{\max} with solid bitumen %*Ro* but the relationship between λ_{\max} and %*Ro* requires standardization. The convenor highlighted the need for the compilation of calibration sets towards this direction.

In conclusion, Paul Hackley indicated that he intends to provide a report paper and update the webpage of the WG, and provide a short notice for the ICCP newsletter announcing that the activities of the WG are finalized. It is also the intention of the convenors to publish a peer-reviewed article summarizing the results from this WG.

Discussion:

During the discussion, the convenor answered technical questions around CLSM and no further action or suggestion was advised from the floor.

Commission II thanks Paul and Jolanta for their time and effort in convening this WG and congratulates them.

10:10 – 10:30 – DOMVR and Component Identification on microscopy samples in Com.II. – Convenor: Angeles Gomez Borrego

The objective of the WG is the compilation of all information related to microscopy samples that were and are worked in the various WGs of Com.II. Angeles G. Borrego demonstrated the online inventory that has been created in the WG webpage. It contains a list of samples

matched with the related WG and the objectives of analysis of each sample. The list contains 65 samples, 35 of which have already complete information associated with them and another 10 samples have the compilation of their information in progress. Both published and unpublished documents related to these samples have also been uploaded with part of those documents being open and part of them being restricted. The convenor stated that at the moment all documents are located in the restricted part of the webpage but the intention is to split the documents among those that can be published on the free part of the website and those that cannot. The convenor also demonstrated examples of sample sheets with complete information and navigated through the various entries to show which type of information is available per sample. This information includes sample origin, years that it was analysed, WG, convenors, age, depositional environment, sample owner and history, thermal maturity, reflectance histograms, representative photomicrographs and specific remarks. The convenor acknowledged the contribution of Deolinda Flores for providing DOMVR reports, Carla Araujo for compiling information from the Thermal Indices WG, and João Graciano Mendonça Filho and Paul Hackley for providing both sample sheets and reports of the OMCWG and IPVWG, respectively.

Discussion:

Angeles G. Borrego stated that this inventory and individual sample sheets are a valuable ICCP asset and new members should get familiar with the record and archive of ICCP and the past activities. She also suggested that it would be beneficial and helpful for young professionals to assist with the compilation of information and sample sheet and asked for volunteers from the floor to carry on with this task. Konstantis Perleros offered to assist.

Commission II thanks Angeles for her dedicated efforts in coordinating this WG and welcomes and encourages Konstantis to assist her with the same amount of dedication.

10:30 – 11:00 – Coffee Break

11:00 – 11:10 – Dispersed Organic Matter in Sedimentary Rocks, Classification, Identification and Thermal Maturity – Convenors: Jolanta Kus, Paul C. Hackley, Paula A. Gonçalves

Jolanta Kus gave credit to all former contributors to the White Paper between 1995-2019 and presented a short overview of activities between 2019-2021 and future plans. The 2019-

2021 activities, also impacted by COVID-related issues, included reviewing of structure and content of the 12th version of the draft, familiarizing with suggestions made by the previous Convenor, make proposals on the structure of each sub-paragraph and circulation among all contributors for feedback and approval. Defining deliverables for each of the contributors was an outstanding item from the list of these first-step activities which is yet to be accomplished. The plan for 2022 activities includes preparation of the first updated contributions for selected sub-paragraphs and discussion of the workflow and subsequent activities or tasks among the contributors.

Discussion:

Maria Hámor-Vidó congratulated Jolanta for progressing with the White Paper and expressed her satisfaction to see the task fulfilled.

Commission II thanks Jolanta, Paul and Paula for their contribution to the White Paper.

11:10 – 11:50 – Identification of Dispersed Organic Matter – Convenor: Jolanta Kus

The aims of this WG are to test and assess a potential suitability of the ICCP-TSOP Classification System of DOM in identification of organic components in whole rock pellets and to modify, if necessary, the ICCP definitions of liptinite macerals (lamalginate, telalginate and bituminite-ICCP, 1993). Jolanta Kus presented the preliminary results of the 2020-2021 round robin exercise of this WG after briefly mentioning the history of past activities of the WG and thanking all participants for doing the exercise during a period with many restrictions and difficulties in accessing laboratory facilities. She then presented an overview of the sample distributed to the participants with regards to sampling location, geological formation and age (Kimmeridge Clay Formation), as well as lithology and depositional environment. The sample was taken from mudstones interbedded with sandstones belonging to the Brae Member penetrated by the 16/17-14 exploration well. At this point the convenor acknowledged the contribution and assistance of Tracy Gallagher from the British Geological Survey for assisting with access to the core and sampling. The results presented in the Prague Meeting were preliminary since not all participants had submitted their results yet. The ultimate deadline for submission of results is set on the 31st of December 2021. For this reason, the Convenor did not disclose the group average %Ro and standard deviation for vitrinite, solid bitumen and bituminite, respectively and showed only the comparison of these values among them highlighting the presence of outliers for each of the measured macerals. She also made a comparison to the previous exercise that was performed on a

sample of lower thermal maturity from the same geological formation. In the case of vitrinite, a single population was identified by most of the analysts as indigenous as opposed to the 2018 exercise, where two populations had been identified by most of the analysts. The outliers in this year's exercise were attributed to the inclusion of either recycled vitrinite or impregnated vitrinite in the final set of results. The convenor also requested the individual sets of measurements from each analyst and constructed histograms with 0.025% bins. The histograms revealed that there is an overlap between the lower reflecting-vitrinite and the reflectance of solid bitumen but also that two distinct populations of bituminite reflectance were reported by the participants. This was not similar to what was observed in the 2018 exercise, where bituminite reflectance had a unimodal distribution. The convenor asked for comments on this trend and stated that she expects this distribution to become smoother as more participants submit their results. In an attempt to explain outliers and high personal standard deviations observed by some analysts the Convenor commented on the nature of the sample, which has limited amount of well-discernible vitrinite particles and difficulties with polishing resulting in uneven particle surface or sloping impacting the quality of the measurement. The Convenor concluded the presentation showing photomicrographs containing examples of individual macerals without disclosing further information and she acknowledged the contribution of all participants, Tracy Gallagher of BGS for granting sampling access and Stavros Kalaitzidis for updating the WG webpage.

Discussion:

Several comments were made from the audience on the excellent quality of the photomicrographs presented. The convenor replied that this was the result of dry-polishing. A suggestion by Stavros Kalaitzidis was made to circulate pellets polished with the same technique to all participants so a common starting point would be achieved overcoming polishing difficulties. The convenor agreed to try and do this in the next round robin exercise.

Commission II congratulates Jolanta for the hard work in organizing this year's round robin exercise and her continuous dedication in this WG.

11:50 – 12:10 – Identification of Thermal Maturity Relevant Organic Matter WG–

Convenor: Paul Hackley

The objective of the WG is to provide guidelines for identification of thermal maturity relevant organic matter population in sedimentary samples rich in dispersed organic matter. The

Convenor gave a short summary of the problematics to be solved, the WG history, and 2012-2013 and 2015-2016 round robin exercises. The results of the 2012-2013 round robin exercise were presented in 2013 at the ICCP Meeting in Sosnowiec, Poland, and were compiled in a manuscript submitted in 2015 to Marine & Pet. Geol. The 2015-2016 round robin exercise included six high maturity samples with high TOC that selected for reflectance measurements according to D7708-11 Standard. The results were presented in the Houston Meeting in 2016 and after two rounds of processing and discussion in 2017-2018 were published in Marine & Pet. Geology in April 2020. The results displayed a rather poor reproducibility calling for a statistical method to discriminate outliers. They also showed that solid bitumen versus vitrinite identification is still an issue in North American shales.. The Convenor emphasized on how to optimize reproducibility given the $s.d. > 0.15 \cdot R_o$ criterion, as one of the most robust one among others. Paul Hackley indicated that there is a continued need for standardization and that the improvement of reproducibility provides a realistic uncertainty in V_{Rr}% measurements. A photographic round robin with the sample samples to investigate what the analysts identify as vitrinite and solid bitumen is proposed for 2021-2022. The exercise will be carried out either on PowerPoint marked photomicrographs with an excel template to report results and/or use the Hilgers Fossil Student version to perform measurements on calibrated images. It is intended that this exercise will be primarily targeted to analysts with high experience to obtain a less divergent set of results.

Discussion:

Maria Mastalerz indicated that identification of vitrinite vs. solid bitumen is a complex issue in N. American Shales and even with a statistical approach, it is very difficult to pinpoint what the problem in the identification is.

Angeles G. Borrego suggested to run the photomicrograph-based exercise in two rounds, one with an image alone without annotation and a second round with the annotated image and observe the difference in the measurement. Paul Hackley found this idea good and agreed to adopt it for the next exercise.

George Siavalas asked what the criteria will be for selecting the more experience analysts. Paul Hackley responded that he does not want to exclude anyone from doing the exercise but intends to do an evaluation of the results in different groups.

Commission II thanks Paul Hackley for his highly valued work and determination offered within this WG

12:10 – 12:15 – Coal-bed Methane and CO₂ sequestration WG – Convenor: Lila Gurba

Jolanta Kus presented a brief note received by e-mail on behalf of Lila Gurba who was unable to attend the meeting. The note summarized all past activities of the WG and repeated that in the Hague Meeting it was agreed that Balram Tiwari and Konrad Ziemianin would gradually take over the Convenor roles. It also gave a short plan of 2021-2022 activities, which included updating the ICCP website with past activities, finalising the “Factors controlling adsorption capacities of coal seams – Review & Database” document, reviewing of current R&D and identify (priority) issues and problems related to coal and organic petrology, and decide on potential (review) publication(s).

Discussion:

Jolanta Kus asked Konrad to provide a status update on the takeover process. Konrad responded that little progress has been made and that it is still at a preliminary stage due to COVID-related delays. It was agreed that a video call among Lila, Balram, Konrad, Chair & Secretary of Com.II will be organized to discuss the future of the WG.

Commission II thanks Lila for her ongoing work in this WG and encourages Konrad and Balram to continue her work in the future.

12:15 – 12:20 – Out of Programme request: Henny Gerschel

Henny Gerschel enquired whether somebody has experience working with bitumen-rich coals and if suggestions for similar coal deposits could be given to her. Some feedback was provided by the audience and Jolanta Kus suggested Henny to post the question in the ICCP Newsletter to receive feedback from the broader community of organic petrology and coal geology.

12:20 – 14:50 – Lunch Break and ICCP Council Meeting

14:45 – 14:50 - Shale Gas WG – Convenor: Lila Gurba

No update was received on behalf of the convenor for this WG and the presentation and discussion were removed from the programme of Commission II meeting.

14:50 – 15:40 – Palynofacies WG – Convenor: João Graciano Mendonça Filho

The objective of this WG is the correlation of palynofacies with macerals. The Convenor presented an overview of the history of the WG with focus on results of past exercises. After a short overview of organic matter groups and criteria for the classification of organic matter in transmitted light, the Convenor showed the sequence of the 5 exercises performed so far in this WG and of two more exercises planned to be executed in the next few years. The exercises were performed on both whole-rock (WR) samples and kerogen concentrates (KC) in reflected (RWL) and transmitted white light (TWL), respectively. The first two exercises focused on the identification of phytoclasts, the third exercise focused on the identification of marine palynomorphs, the fourth on the identification of continental (both aquatic and terrigenous) palynomorphs and the 5th exercise on amorphous organic matter (AOM) originated from phytoclasts. A detailed analysis of points of agreement and disagreement among the analysts and the main conclusions from each exercise were presented. The convenor proposed the execution of a 6th exercise in 2022 that will focus on marine and bacterial amorphous organic matter. The exercise will be performed on two samples, both originated from Brazil. The first sample is of Aptian age, has low content in carbonate minerals and a TOC of 3.46 wt.% and the second is of Cenomanian-Turonian age, is rich in carbonate minerals and has a TOC of 0.58 wt.%. The Convenor asked from analysts who are interested in participating to this exercise to register to the WG.

Discussion:

Angeles G. Borrego made the remark that participants in the previous rounds did not have to register again and should be by default considered as participants in this new exercise. The remark was adopted.

Commission II thanks João Graciano for his hard work and willingness to continue with the activities of this WG.

15:40 – 16:30 – Dispersed Organic Matter Vitrinite Reflectance Accreditation Programme – Chair - João Graciano Mendonça Filho

The Chair presented the report of the 2020 DOMVR accreditation round. The report was structured in chapters including the description of the distributed samples, the distribution of participants per geographic regions and their ICCP member vs. non-member status, the evaluation of the results, the timeline of the accreditation programme with regards to call for participation, application, sample distribution, submission of results, feedback to participants and issuing of certificates. The organizer also gave an summary of the final number of participants who submitted results compared to those

who initially applied, showed the success rate of participants and gave an overview of the samples delivered this round to continuing participants describing their depositional environment and general characteristics. He also explained the statistical evaluation process and highlighted the outstanding performance of the accreditation database. At the end of the presentation the organizer showed an overview of the sample bank demonstrating its critical status and highlighting the urgency and desperate need for replenishment with new samples. He stated that the samples currently available in the sample bank are not enough for running the 2022 accreditation round. João Graciano acknowledged the significant contribution and help of Jolanta Kus, Peter Crosdale, Magdalena Misz-Kennan and Deolinda Flores in the successful execution of the DOMVR 2020 exercise.

Discussion:

There was a general consensus that action must be taken to add new samples to the sample bank with some members stating that they will try and secure samples. Jolanta Kus suggested that an announcement should also be placed in the ICCP Newsletter asking for supply of suitable samples for this accreditation programme. The suggestion was accepted by the Chair.

Commission II congratulates João Graciano for running another successful DOMVR exercise and thanks him for his dedication and determination to continue carrying out this very important ICCP activity.

16:30-17:00 – Closing remarks – Jolanta Kus & George Siavalas

Jolanta Kus opened the closing session of Commission II asking for proposals from the floor for new WGs in Commission II. George Siavalas stated that he wants to propose the formation of a new WG that will focus on the study of solid bitumen in sedimentary rocks. He presented the current understanding of the term solid bitumen among different geoscience disciplines, an overview of existing classification schemes and current understanding on processes that result in bitumen formation, and demonstrated the need for the study and classification of these components based on optical properties only. A list of anticipated deliverables was also presented. The proposal was supported by the audience and it was agreed to create the proposed WG. The new WG will be titled “Identification of Secondary Organic Matter in Sedimentary Rocks” to be co-convened by George Siavalas and Paul Hackley. The convenors also agreed to contact Hamed Sanei and ask him to join the convenor team. A call for partic

Jolanta Kus congratulated all Convenors of the WGs as well as the numerous participants of the ICCP Commission II for their valued and inspiring work and productive discussions. The Chair also recognised ICCP members, who have actively participated in a number of the round robin exercises

and encouraged all Convenors to publish the acquired and obtained results in international journals and the ICCP News.

The meeting of Commission II ended at 17.00 on September 22nd 2021.