

positive results. Private universities need to significantly increase their contribution to research through collaboration with research organizations. Initiatives must be made from both ends.

To break into the league of world-class universities, one needs to redefine universities, where disciplinary boundaries are transcended across knowledge domains of science, social sciences and humanities. The doctoral and postdoctoral programmes need to be strengthened. It was pointed out that 500–600 PhDs can be trained as postdoctoral stu-

dents abroad at our own expense by taking the brick-and-mortar expense of two universities. Provision of untied, independent grants and creating opportunities for faculty and students to interact and collaborate with the best of the world on an equal footing will be some of the steps in the right direction.

The conference served as a successful platform to set new directions for the growth and transformation of the higher education in India. Indian universities have the potential, but responding to and more appropriately shaping change is the

essence if India has to stake claim to be among the top-ranking universities of the world.

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MEETING REPORT

Coal and organic petrology*

The International Conference on Coal and Organic Petrology was the first joint meeting of the International Committee for Coal and Organic Petrology (ICCP) and The Society for Organic Petrology (TSOP) (60th of ICCP and 25th of TSOP) held in Europe, featuring the following topics: General coal and organic petrology; Geological applications of coal and organic petrology, and Industrial applications of coal petrology.

Studies under the topics were covered in the ICCP accreditation programmes on three successive days and TSOP technical sessions in the following two days. More than 130 scientists from varied disciplines in coal science representing 28 countries, participated in the conference.

The conference started with a council meeting on the first day. On 22 September, Isabel Suarez-Ruiz (Chair of the Organizing Committee) welcomed the CSIC Vice-President, Rosa Menendez Lopez and all the delegates which was

followed by an opening address by Lopez and keynote lecture by the General Director for Research and New Developments of HUNOSA (an international coal brand in UK) on 'Asturian coal basins: from traditional mining to new uses'. The first plenary session of the ICCP General Assembly was chaired by Petra David (President and General Secretary, ICCP). A report on 'Environmental applications of organic petrology' under 'Organic petrology and geochemistry in environmental technology' was presented by Hamed Sanei (Convener of ICCP Commission II). Reports of ICCP Commissions I–III respectively, were presented by Walter Pickel (Australia), M. A. Gomez Borrego (Spain) and Isabel Suarez-Ruiz (Spain). The important research findings carried out by different Working Groups on varied aspects of coal and its constituents, dispersed organic matter, CO₂ sequestration, coal blends, etc. were presented by ICCP member scientists. New Working Groups according to the need of research, proposed by scientists under the ICCP accreditation programmes were accepted. The ICCP meeting ended with the closing plenary session of the General Assembly on 24 September, including ICCP awards ceremony. The Organic Petrology Award for 2008 was given to Borrego for her outstanding contributions and excellent work in the field of organic petrology and also for extensive involvement in ICCP activities. The venues for forth-

coming meetings were decided and information on the next ICCP Annual Meeting to be held at Porto Alegre in 2009 was highlighted by Wolfgang Kalkreuth (Brazil). A microscope session was also organized to observe and discuss the coal and peat petrographic constituents and related aspects.

A scientific ICCP–TSOP joint session on 'Organic petrology in the context of global climate change and greenhouse gases emission' chaired by Borrego started on 25 September. T. Gentzis (USA) delivered a talk on 'CO₂ storage capacity in coals', on the results obtained about combined investigations on coals from USA, Canada and Australia. The session was opened by Leslie Ruppert (President, TSOP). The morning and afternoon technical sessions were organized under the following heads: (i) Coal as gas reservoir and (ii) Organic petrology applied to coal utilization and coal by-products on 25 September, and (iii) Advances in organic petrology and organic geochemistry and (iv) Organic petrology applied to climate and environmental studies on 26 September.

The results of investigations on various coal researches were presented as 28 oral presentations and 49 poster displays. Significant contributions were made on coal, lignite, coke and source-rock characterizations with respect to their genesis, deposition, mineralogy, maturation, technological utilization, sorption behaviour for methane and CO₂, reservoir characteris-

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tics, hydrocarbon generation (methane in particular), geochemistry, etc.

Gentzis reported that higher capacity of adsorption of some coals is the result of the difference in original plant precursors and maturation history that is responsible for geochemical variations in coal. He suggested that a larger quantity of CO₂ can be stored as liquid instead of a gaseous phase, as it liquifies at very high temperature and pressure. Weniger (Germany) presented results of sorption experiments in the context of coal rank and composition, and found weak correlation between maturity and rank, though higher adsorption for CO₂ than methane. C. F. Rodrigues (Portugal) presented the results of gas diffusion (CBM production and CO₂ sequestration) through simulation experiments. W. Kalkreuth (Brazil) suggested the classification of migrabitumen for their correct identification and placement. Speaking on sorption behaviour of Parana Basin coals, he stated that these may serve as a storage place for CO₂ due to their higher adsorption rate for it rather than methane. C. R. Ward (Australia) explained the mode of occurrence of mineral in coals and lignites and suggested their removal. M. Misz-Kennan (Poland) revealed the petrological and geochemical reasons for self-combustion in coal wastes. A. Blandon (Columbia) presented research findings on coal palynofacies as investigated by the combined transmission and fluorescence microscopy. S. M. Rimmer (USA) presented petrological results on coals affected by Jurassic dyke and their petrographic differences with normal heat-affected coal due to burial. N. Wagner (South Africa) emphasized the role of organic petrology in coal characterization and concluded that coal petrology provides a reason for unsuitability of coals for various utilization purposes. C. F. K. Diessel (Australia) proposed the stratigraphic distribution of inertinite maceral taking into consideration the sedimentary rocks from the Palaeozoic to the Cenozoic that may be utilized as a model. L. E. Yoksoolian (USA) gave evidences of PETM (Palaeocene–Eocene

Thermal Maxima) due to release of a large amount of methane by the intrusion of Lower Jurassic dykes/sills in organic-rich sediments, but found no evidence for the release of ¹³C-depleted methane. P. C. Hackley (USA) discussed the petrographic results on shales and the role of the environment in the preservation of macerals, in particular liptinite, the progenitor of hydrocarbons.

Organic petrology is an important tool in deducing the climate and environment during the formation/deposition of coal and lignite. The coal/lignite macerals or microconstituents as characterized through organic petrographic studies (optical microscopy utilizing reflected and fluorescent lights) reveal the complete history of coal, viz. nature, habitat and type of plants/flora serving as the source vegetation, water conditions (pH, ground level, etc.) during formation, Eh or redox-potential, mineral influx, maturation, etc. because each organic microconstituent originates from a specific plant organ/part/tissue in a specific environmental condition. Organic petrological studies when combined with other parameters, viz. geochemical and palaeofloral studies provide more convincing results.

Alpana Singh and B. D. Singh (BSIP, Lucknow) presented a poster on 'Genesis of Indian tertiary lignites: palynopetrological evidences' displaying the petrological and palaeofloral data accumulated on lignites of Neyveli (Miocene), Cauvery Basin, Tamil Nadu and Panandhro (Eocene), Kutch Basin, Gujarat, in order to interpret the depositional conditions and nature and transformation of vegetal matter. Both the parameters individually have some limitations; however, the combined organic petrological (macerals) and palaeofloral (micro- and mega-fossils) records provide a more comprehensive picture on the genesis of Indian Tertiary lignites. The variations in vegetation of India during Miocene and Eocene epochs and also from other countries during the same period were the main areas of interest and discussion. Varieties of resinite and crassicutinite in these

lignites, probably suggesting contribution of mangrove plants as a source vegetation for lignites, were also discussed.

The recommendations were as follows:

- ICCP membership should be given to scientists from varied disciplines in view of the need of in-depth analysis of coal and lignites utilizing maximum parameters.
- More Working Groups should be proposed in ICCP accreditation programmes according to the problems faced and need in coal researches.
- Scientists should be encouraged to join Working Groups.
- Global collaboration of scientists on multidisciplinary coal researches.

Coal is the main energy resource fulfilling the energy demands in many developed and developing countries, including India. Hence, the country's coal/lignite reserves need to be investigated critically for its optimal utilization. Scientists all over the world are engaged in research on various aspects of coal utilizing different parameters. Nature and maturity of coal, depositional environment, geochemistry, mineral content, etc. are the main areas of investigation. Recent researches have emphasized the hydrocarbon prospects (in particular methane gas) from coal/lignite and coal to liquid. The conference provided a common platform for coal and organic petrologists of varied disciplines from around the world, to present their research results and share their knowledge about recent trends and needs in coal researches.

A one-day post-conference field trip to the Asturian Jurassic Coast was also organized.

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