(P.K. Singh et al.) and several other contributions by C.F.R.I. and C.M.R.L., were presented.

Papers on role of GAC in water treatment and industrial streams (G.S. Natarajan), source material used for the preparation GAC, having significant effect on pore structure and adsorption capacity (Shripal Singh et al.), and removal of metal ions with GAC (D. Satapathy et al.) were discussed. Impact of coal composition on combustion and gasification processes (D.N Reddy et al.), LTC of Meghalaya coal (S. Phukan et al.) and of Bapung coal for conversion to petroleum oil, due to high hydrogen content (M. Nath), briquettes of Myanmar lignite (P.N. Sinha et al.) proved interesting contributions. S.C.I. method was devised instead of CI (A.K. Sharma et al.). Increase of carbonisation time resulting in improvement of coking characteristics (K.K. Singh et al.) and other several contributions on diverse aspects were presented.

COAL 2003, thus presented the achievements in work on coal science studies undertaken on various aspects during the past half a century, besides approaches currently in vogue. The Abstracts Volume brought out will be referred to in India and abroad for all the recent developments in Indian Coal Science and Technology. It is hoped that the full text of all the papers will be compiled into a benchmark volume befitting the multidisciplinary data presented at the Seminar. Dr. Kalyan Sen, Director, CFRI deserves full credit for his vigorous organizing calibre, coupled with managerial competence to have so successfully conglomerated together, for the first time, in the country, geologists, geochemists, geophysicist, chemists, engineers, metallurgists, drilling engineers, academicians, manufacturing company representatives and industry magnates, and made the deliberations meaningful and purposeful.

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IMAGE ANALYSIS SYSTEM (IAS) ATTACHED TO A POLARISING MICROSCOPE

Image Analysis Systems (IAS), attached to a high-resolution transmitted and reflected light polarising microscope have been in vogue for some time now but its potential has not been fully utilised in petromineralogical, sedimentological and related studies. IAS comprises essentially hardware consisting of a lens (1/2” or 3/4”) that is to be put at the trinocular eyepiece of the microscope, image capturing facility connected to a CCTV monitor, PC and printer, and software, required for different applications. As this lens gives only 15-20% of the microscopic field of view on the monitor, a C-mount lens system is to be placed in between the above lens and trinocular eyepiece so as to get nearly complete field of view on to the monitor. Notable applications of IAS, attached to a microscope, and their relative advantages over the conventional modes are briefly outline below.

Petrography

Textures and structures of rocks and ores can be photographed and printed on an ordinary or quality paper for better contrast with a high-resolution printer. The system has the additional facility of editing a picture for better contrast of features, sharpness, zooming, indexing and putting bar-scale (see ‘coloured photomicrographs in the paper by Dhana Raju et al./JGSI, v.59(4), pp.299-321,2002). This mode of taking photographs dispenses with time-consuming, cumbersome, multi-stage, costly and unsure procedure using a camera as attachment to microscope, taking photographs either on a negative or diapositive film, its development-printing and cartographic work on photoprints for indexing and putting bar-scale. Furthermore, in the camera-mode it is rather difficult to get always the true colour of ore and gangue minerals, whereas this is not so with IAS.

Determination of ‘Mode’

Modal composition (in vol.%) of a rock, ore or other geological material in a thin/polished-thin section or polished slab can be determined, taking advantage of the differences in the grey levels of constituent minerals. In case the grey levels of two or more minerals like quartz and feldspars are very close, there is a possibility that IAS may not be able to differentiate them resulting in counting them as one mineral. To obviate this, sufficient care is to be taken to make the system understand the conspicuous differences of such minerals by resorting to features like shape, relief, alteration, cleavage, interference colours and by giving even false colours using software to differentiate minerals. The modal
composition determined by IAS is more accurate than that obtained by using conventional point-counter, since in the latter there is a possibility of not counting ultrafine grains that are smaller than the given step-interval during counting.

Estimation of Heavy Mineral Contents in Sands

Microscopic grain-counting, after heavy media and magnetic separation, of different mesh-sizes of a sample is an important step in estimating the percentage of heavy minerals like ilmenite, garnet, sillimanite, rutile, zircon, monazite etc., in placer coastal and inland sands. This can be better done by IAS as it recognises easily these minerals due to their notable differences in physical and optical characters like colour, relief, shape, isotropic nature etc. The results obtained by IAS are relatively more accurate due to counting of exact area of each grain of minerals unlike assuming the same area for numerous grains in a given mesh-size in the conventional method, which leads to notable departure from the exact area of grains during counting.

Determination of Sedimentological Parameters

IAS is best suited for this purpose and can be effectively used for determination of different sedimentological parameters like size (range, mean, median and mode), shape, length/breadth (L/B) value, angularity, degree of roundness of grains, clast-matrix-cement ratio and size-range of clasts in a sedimentary rock, all of which have important bearing in probing aspects like provenance, degree and mode of transportation and depositional environment. The conventional methods for determination of these parameters are time-consuming with lot of strain to the eyes, whereas the IAS mode is fast and more accurate.

SSNTD Study on Radioactive Minerals

Solid State Nuclear Track Detection (SSNTD), using alpha-sensitive cellulose nitrate (CN) films, like conventional autoradiography using fast photographic film, is an important mode of study while investigating radioactive samples as it helps to locate radioactive minerals in thin/polished-thin sections and polished slabs. In the presently followed SSNTD study, it is possible only to qualify the radioactive minerals as of low, medium and high radioactivity, corresponding, respectively, to low, medium and high density alpha-tracks in a unit area recorded on CN film. However, with IAS it is possible to quantify, at least semi-quantitatively, the amount of radioactivity contributed by respective minerals in a rock or an ore by counting the discernable alpha-tracks on CN films exposed for varying period of time, viz., about 3 hours for highly radioactive minerals like uraninite, 1-2 days for medium radioactive minerals like coffinite and brannerite, and about a week for low radioactive minerals like zircon, allanite and monazite, and by integrating the data on density of alpha-tracks vis-a-vis period of exposure of the same section. This information of relative contribution of radioactivity, together with respective contents, of easily leachable and refractory radioactive minerals has important implications in mineral processing during exploitation of radioactive ores.

Apart from the above, other advantage of IAS are:

(i) ready plotting of data in different diagrams like histograms, cumulative curves, pie diagrams and bi-/tri-linear plots;
(ii) demonstration of features on CCTV monitor for a group of persons instead to individuals as on a microscope;
(iii) facility of incorporation of microscopic features of geological materials in their descriptive part of text; and
(iv) recording-storing-retrieving data, as and when required, from the memory of PC on to a floppy, besides availing the PC part of the system for routine computer work.

The IAS, including software, costs about Rs. 4.5 lakhs, and is available from manufacturers based at Pune, Hyderabad, Mumbai, Delhi and Kolkata. A few such systems are in operation in the Laboratories of the Atomic Minerals Directorate for Exploration and Research, Geological Survey of India, National Geophysical Research Institute and a few University Departments, besides others.