



CFRI NEWSLETTER



Vol. 3 No.1 Quarterly Issue Jan-March 2003

Established in November 1946, CFRI is a unique Institute of its kind in India under CSIR to conduct research in different areas of Fuel Science and Technology with emphasis on coal and lignite

Mission: Enhance the position of the Institute as a premier R&D centre for technology development and transfer by forging strategic alliance with other agencies and continuously strive for excellence in the area of potential expertise for generation of basic knowledge, innovation and advanced concepts in science and technology for economic, efficient and environmentally safe energy management

HIGHLIGHTS OF THE COMPLETED PROJECTS

BIOTECHNOLOGICAL CONVERSION OF LIGNITE TO HUMIC ACID (SSRC, Dept. of Coal, Govt of India, New Delhi)

Among the 50-isolated strains, six fungal stains (*Aspergillus fumigatus*-two strains, *Fusarium udum*, *Fusarium solani*, *Aspergillus oryzae*, *Aspergillus sydowii*) and two bacterial strains (*Baccillus* species and *Baccillus licheniformis*) were identified and found quite suitable for lignite solubilization. The maximum solubilization of lignite was achieved up to 26% in 2- 3 weeks fermentation/ incubation period. Qualitatively humic acid derived from bio-solubilization was quite comparable with the standard humic acid and rather superior to chemically synthesized humic acid from nutritional point of view, apart from comparatively less content of trace and heavy metals and negligible PAH. The bio-solubilized humic acid was found more effective in increasing the yield of crops grown in comparison to chemically extracted humic acid together with better soil fertility status. This biotechnological process is techno-economically feasible.

HF- T SYNTHESIS: DEVELOPMENT OF CATALYSTS FOR WAX PRODUCTION (Dept. of Science & Technology, Govt of India, New Delhi).

With a view to developing improved Fe/Co-based catalysts for maximizing wax yield, R & D work was carried out and ultimately two catalysts were prepared by precipitation and impregnation methods using appropriate precursor salts of cobalt and magnesium. The impregnated Co-based catalysts were subjected to drying, calcination, palletizing and sizing before charging to single tube reactor (STR). The activity of these catalysts were studied in the temperature range 200 -220oC, pressure 12-13 bar, GHSV 650-h and H₂/CO ~ 2.0. The impregnated catalysts were tested for 48 hours. Particular liquid product showed wax yield of 55% of C₅+ fractions. A Multi-point Recorder was installed for recording temperature of various zones. For N₂ supply to dowtherm, heat transfer liquid was up-graded by providing pressure circulation arrangement through replacement of existing connectors. The study would lead to the development of a technology for high purity sulphur and aromatic free wax, which is eco-friendly. By hydrocracking wax, diesel oil with high cetane number can be produced in the present context of implementing the latest emission standards.

De-NO_x BY CATALYTIC DECOMPOSITION (In-House Project)

With an objective to develop the catalysts and process parameters for decomposition of NO_x, six catalysts containing Al, Mg, Ti, Co, W and Ag in different combinations as mixed oxide and hydrotalcite type compounds. The activity tests of the catalysts were performed in a glass reactor with experimental temperature range 300-400oC at atmospheric pressure. The space velocity of the feed gas was in the range 10,000 -15,000h⁻¹ for different experiments and the product was analyzed by GC using ECD detector. Among the catalysts studied, the maximum decomposition of NO_x (52.2%) was achieved with Co/Ag₂O catalyst at 400oC. Two more batches of catalysts were also prepared by hydrotalcite method containing V in one preparation and chromium oxide in the other. This indigenous technology for direct decomposition of NO_x from thermal power plants and automobiles may help in minimizing the pollution problem of environment and health hazards.

R & D PAPERS PUBLISHED

1. Srivastava, R. C., Sinha, J., Srivastava, S. K. and Tripathi, S.C., Nickel Catalyzed Steam Gasification of

Chars obtained from Coal-Alkali Reaction at 6000C, Fuel (London), 82, 2003, 93-96

2. Kumar Rajesh, Janardhanan, K.K. and Kamal, Studies on the effect of Carbon Sources, N Compounds and Amino Acids on the Growth and Ergot Alkaloid Production by *Claviceps paspali* Stevens and Hall in Submerged Culture, J. Basic Appli. Mycol., 1(1), 2002, 44-49.

ACCREDITATION FOR CFRI BILASPUR

CFRI Unit Bilaspur has been recognized with the Certificate of Accreditation by National Accreditation Board for Testing and Calibration Laboratory (NABL), Deptt. of Science & Technology, New Delhi, India for its facilities in the field of 'Chemical Testing'. The certificate bearing the No.T-0128 is valid up to 14.05.2005.



Shri P.K. Bandopadhyay saluting the National Flag on Republic Day

REPUBLIC DAY

Fifty-fourth Republic Day was celebrated in the Institute on 26 Jan. 2003. On this occasion, Shri P. K. Bandopadhyay, Scientist F hoisted the national flag in front of the main building. He also addressed the gathering of staff members, security personnel and children. Sweets were distributed among the children.

NATIONAL SCIENCE DAY

The day of discovery of Raman's Effect is celebrated as National Science Day every year on 28th February in India. On this occasion, Prof. B. B. Bhattacharya, Director, Indian School of Mines, Dhanbad delivered National Science Day Lecture on "Gas Hydrates: Is it going to be the fuel for 21st century?". The programme started with floral tribute to Sir C. V. Raman. Dr Kalyan Sen, Director in his welcome address advised the scientists of the institute to do valuable research for the benefit of the people. Dr. K. K. Tiwari, Head, Technical Information Division made the audience aware about the sequential research programme carried out by Sir C.V. Raman leading to discovery of Raman's Effect and also his other leading role in the development of science. Dr. Abhijit Sarkar, Scientist proposed a vote of thanks. In his speech, he expressed sorrow on the loss of Miss Kalpana Chawala, a space scientist who died in the Colombia Space Craft explosion in USA. He told that it is a great loss for India in the field of science.



A view of National Science Day celebration (L-R Dr K. Sen, Dr A. Sarkar, Prof. B.B. Bhattacharya

DEPUTATION ABROAD

Dr. Anand Kamavisdar, Gr.III (1) CFRI Unit Nagpur has been deputed to Austria under North South Dialogue Scholarship Programme of Austrian Exchange Service with effect from 03.01.2003. Deputation has been made for one year to Department Corporation New University Campus, Vienna, Austria.

TASK FORCE MEETING

CSIR, New Delhi has constituted Task Force for taking up challenges in various R & D activities. CFRI, Dhanbad is a nodal agency for the two task forces namely (i) Resource Quality Assessment and (ii) Coal Preparation. A meeting under the chairmanship of Dr. Kalyan Sen was held at CFRI from 3 to 4 Feb. 2003 for detailed discussion on the activities under each project proposal. In the meeting, representative scientists from different laboratories of CSIR such as CFRI, Dhanbad; NML, Jamshedpur; RRL, Jorhat; RRL, Bhubaneshwar; RRL, Bhopal participated. IICT, Hyderabad is also a member of this task force but could not attend the meeting. Members who represented their laboratories were Dr. S. K. Hajra from C.F.R.I.; Mr. S.K. Mishra, Mr. P.S.R. Reddy and Dr. S. K. Biswal from R.R.L, Bhubaneshwar; Dr. B. Nayak and Shri. K. K. Bhattacharya from NML, Jamshedpur; Dr. B. P. Baruah from RRL, Jorhat and Dr. J. P. Barnwal from RRL, Bhopal.

PATENT INFORMATION: COAL AND ITS UTILIZATION

- United States Patent Application 20020179493 A1 December 5, 2002
Title: Production and use of a premium fuel grade petroleum coke
Inventors: Etter, Roger G. (Cardington, OH)

Abstract: A modified technology for producing premium "fuel-grade" petroleum coke is disclosed where coking process parameters are controlled to consistently produce petroleum coke within a predetermined range for volatile combustible material (VCM) content.

- United States Patent Application 20030022035 A1 January 30, 2003
Title: Process and system for converting carbonaceous feedstock into energy without green house gas emissions.
Inventors: Galloway, Terry R. (Berkeley, CA).

Abstract: The process and system of the invention converts carbonaceous feedstock from carbonaceous-containing hazardous waste, medical waste and mixtures thereof into electrical energy without the production of unwanted greenhouse emissions.

- United States Patent Application 20030024853 A1 February 6, 2003.
Title: Method for efficient and environmentally clean utilization of solid fuels.
Inventors: Lyon, Richard K. (Pittstown, NJ).

Abstract: This invention provides a process for oxidizing ash and sulfur containing fuel such as coal in order to power gas turbines using a material such as the oxide of iron, which in an oxidized state can be readily reduced, and which in a reduced state is readily oxidized.

- United States Patent Application 20030032707 A1 February 13, 2003
Title: Filler comprising fly ash for use in polymer composites.
Inventors: Hemmings, Raymond T. (Kennesaw, GA); Hill, Russell L. (San Antonio, TX); Cornelius, Bruce J. (Waterdown, CA).

Abstract: The present invention discloses fly ash as a filler or filler blend having a particle size distribution with at least three modes that can be combined with a polymer at higher filler loadings to produce a filled polymer for polymer composites.

WORKSHOP ON COAL TESTING

A five-day workshop on Coal Testing and Analysis was organized by CFRI Unit Bilaspur during 10-15 March 2003. In this workshop thirteen trainees participated

HINDI WORKSHOP

A two-day Hindi workshop was organized during 6-7 March 2003 to train the administrative staff of the institute for better performance in day-to-day official work in Hindi. This is in a sequel to the workshops organized every three months on the policy and directives of Department of

Official Language (Hindi), Ministry of Home Affairs, Govt of India, New Delhi and as per the instruction of CSIR.

The workshop covering both administrative and scientific topics was conducted by S/Sri Naresh Kumar Sharma, Sr. Hindi Officer, DRM Office, Dhanbad; Srinath Singh, Sr. Hindi Officer, BCCL, Dhanbad; G.K. Prasad, Hindi Officer and Shailabh, Scientist, CFRI. Thirty participants attended this workshop.

MERGER OF CFRI UNITS

CFRI Unit Raniganj has been merged with CFRI, Dhanbad with effect from December 2002. All the staff members of this unit joined the CFRI Head Quarter in different Divisions/Sections as per requirement of the staff.

In another decision, CFRI Unit Jorhat merged with Regional Research Laboratory, Jorhat with effect from February 2003. All the 11 staff members of this unit joined the RRL, Jorhat.

WORLD AROUND

BUILDING BLOCKS FROM WASTE

An industrial-scale pilot plant at the University of East London (UEL), UK, transforms wastes into building blocks. The lightweight aggregates are produced utilizing incinerator bottom ash, sewage and dredge sludge. Funded by a Landfill Tax Credit grant, allotted by the RMC Environment Fund and scrutinized by the Manufactured Aggregate Research Centre (MARC), the facility incorporates latest thermal processing techniques and employs power generated from waste to 'roast' the materials into coated pellets for use in the construction industry. A UEL team is testing batches of pelletized aggregate from MARC, which uses a 'Trefoil' kiln shaped like a 3-leaf clover to create an even cascade of pellets.

(Source: Waste Technology, Jan-Feb, 2003).

ETHANOL FROM CORN STOVER

Researchers at Purdue University, US, have developed a pre-treatment process that can convert the fiber left over to ethanol after the processing of starch from corn kernel. This process based on genetically engineered yeast, is ready for development with corn stover.

Corn stover fiber is different from the fiber found in the kernel, though both materials contain cellulose that can be converted into sugars, which can then be fermented to form ethanol.

Research is underway at Purdue's Laboratory of Renewable Resources Engineering. The Indiana Department of Commerce has awarded a grant of US\$80,000 to modify the process.

(Source: Waste Technology: Jan-Feb, 2003)

RECOVERING METHANE FROM FOOD WASTE

In the Republic of Korea, a team of researchers has developed a new process for recovering methane and composting matter from food wastes. The multi-step sequential batch two-phases anaerobic composting technique (MUSTAC) comprises five leaching beds for hydrolysis, acidification and post-treatment in addition to an up-flow anaerobic sludge blanket (UASB) reactor for methane recovery. It involves the combined modus operandi of sequential batch operation and two-phase anaerobic digestion for simple operation and high efficiency.

Rumen micro-organisms are used to enhance cellulolytic activity. Five leaching beds are used in a multi-step mode with a two-day interval between degradation stages. Acidified products in the leachate from the leaching beds are converted to methane in the UASB reactor. The MUSTAC process has demonstrated that 84.9 per cent of volatile solids (VS) can be removed and 85.6 per cent of biochemical methane potential can be converted into methane at 10.9 Kg VS/m³/d in 10 days. Output from the post-treatment of residues could be used for soil amendment.

(Source: Waste Technology, Jan-Feb, 2003)

US TO BUILD A POLLUTION-FREE POWER PLANT OF THE FUTURE

The US plans to build a prototype of the fossil fuel power plant of the future- a \$ 1 billion venture that will combine both electricity and hydrogen production with the virtual total elimination of harmful emissions including green house gases. According to the US Secretary of Energy, "FuturGen will be one of the boldest steps our nation has taken toward a pollution free energy future". The knowledge acquired from FuturGen will turn coal from an environmentally challenging energy resource into an environment-friendly one. This prototype power plant, to be designed and built in next five years and its operation for five years or beyond, will serve as the test bed for demonstrating the best technologies the world has to offer. In fact every aspect of the prototype plant will be based on cutting-edge technology comprising the plant design by industrial group capable of turning coal into a hydrogen-rich gas, rather than burning it directly, so that hydrogen could then be combusted in a turbine or used in a fuel cell to produce clean electricity, or fed to a

refinery help upgrade petroleum products. In the future, the plant could become a model hydrogen-production facility as per the initiative of President Bush to develop a new fleet of hydrogen-powered cars and trucks. Common air pollutants viz. oxides of S and N would be cleaned from the coal gases and converted to usable byproducts such as fertilizer and soil improver apart from the capturing of almost 100% carbon dioxide through setting up a prototype unique plant followed by its sequestering in deep underground formations, possibly into the thousands feet deep underground brackish reservoirs, or into oil/gas reservoirs, or into unminable coal seams, or basalt formations for enabling the permanent isolation from the atmosphere.

The plant would be the size of generating about 273 megawatts electricity i.e. equivalent to an average mid size coal fired power plant, which will be a stepping stone toward a future coal fired power plant with no emission and unprecedented efficiency of about 60% or almost double of the conventional coal burning plants. As such the ultimate goal is to show how new technology can eliminate environmental concerns over the future use of coal and allow the nation to tap the full potential of its massive coal deposits.

(Source: Greenhouse Issues, No.65, March 2003.)

NEW ARRIVALS IN LIBRARY

Following seven books have been received in the library:

* Manorama Year Book 2002.

* India-2002, Publication Division, Govt of India.

* Solid Sample Analysis: Direct and Slurry Sampling using GF-AAS and ETV-ICP edited by Ulrich Kurfurst, Springer, New York, 1998.

* Standard Methods for Analysis and Testing of Petroleum and Related Products and BS 2000 Parts 2002 in two volumes (with CD-ROM), edited by John Phipps, The Institute of Petroleum, 2002.

* Microscopic X-ray Fluorescence Analysis, edited by Jannsem KHA, Adams FCV, Rindby A, John Wiley and Sons Ltd., New York, 2000.

* X-ray Fluorescence Spectrometry, 2nd Ed, edited by Ron Jenkins, John Wiley and Sons Ltd., New York, 1999.

* TERI Energy Data Directory and Yearbook 2001/2002, TERI, New Delhi, 2002

CFRI IN MEDIA

- CFRI Swings to Chhourhythem (Hindustan Times, 03.01.03)
- Cultural programme at CFRI (Prabhat Khabar: 10.01.03)
- Thirty five donate blood at CFRI camp (Hindustan Times, Prabhat Khabar and Dainik Jagran: 13.01.03).
- Workshop at CFRI for encouraging interest in Science (Hindustan and Hindustan Times: 18.01.03)
- Gosthi at CFRI on 'Why and how to write on the issues of Jharkhand and Chattisgarh?'. (Chamakta Aina, Prabhat Khabar, Bihar Observer, Hindustan, Hindustan Times, Awaz: 24.01.03 and Prabhat Khabar, 25.01.03)
- Commendable R & D work at CFRI: Dr. Tiwari (Chamakta Aina, 24.01.03)
- CFRI to hold National Seminar on 'Coal- 2020' on 20-21 April 2003 (Hindustan Times, 24.01.03)
- A collective discussion in CFRI Workshop on 'Coal-2020' (Prabhat Khabar, 25.01.03)
- Science is endowed with art: Partho Sengupta (Prabhat Khabar, 26.01.03).

- Science- an organ of society, media its mirror: Bandopadhyay (Hindustan, 29.01.03).
- Sit and draw competition cum Painting Exhibition at CFRI: a riot of color (Hindustan Times, 11.02.2003).
- CFRI's administrator passes away (Hindustan and Prabhat Khabar, 18.02.03).
- CFRI observes Vigyan Divas (Prabhat Khabar, 02.03.03).
- Hindi workshop ends (Hindustan, 08.03.03).

EVENTS AHEAD

1. Research Council meeting on 19 April 2003.
2. National Seminar (Coal Science & Technology-Vision 2020) on 20-21 April 2003.
3. CFRI's Foundation Day celebration on 22 April 2003.
4. CSIR Diamond Jubilee Exhibition 20-25 April 1993
5. Management Council Meeting on 30 April 2003.
6. National Technology Day on 11 May 2003.

CONTACT ADDRESS

Central Fuel Research Institute, P.O.-FRI, Dhanbad -828108, Jharkhand, India.

Telephone - EPABX: (0326)-381001 to 381010, 381152, 381173, 381195 and 381200.

FAX: (0326)-381113, 381385 and 381560.

Email: dnb_dcfri@sancharnet.in

Website: <http://www.cfrindia.com>

Compiled & Edited by Dr L. C. Ram, Shri P. C. Kumar
and Dr Rajesh Kumar, Typing Assistance by Shri R. N.
Sharma, Published by Director, CFRI, Dhanbad.