

# CSIR NEWS

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Team CSIR



## IICT's Technology for Improved Process for Heptafluoropropane transferred to industry

**THE Indian Institute of Chemical Technology (IICT), Hyderabad,** developed an improved process for heptafluoropropane (FM-200) and released it to Centre for Environment and Explosive Safety (CFEES/DRDO). The technology has been recently passed on to M/s Mechvac Fabricators (I) Pvt. Limited, Mumbai, for commercial production. It may be mentioned here that so far the technology for heptafluoropropane is available only with the United States.

FM-200 is a halon substitute used in fire fighting systems. As per the Montreal Protocol, halons should be phased out as they cause depletion of ozone layer. M/s Mechvac India Pvt. Ltd have already received advance orders for 500 tonnes of FM-200 and the firm is considering to set up three more facilities to meet the demand. The annual domestic requirement of the gas is around 750 tonnes. But M/s Mechvac would be able to provide only 300 tonnes during the first year of operation set up at a cost of Rs 10 crore. The market size for this halon substitute is about Rs 150 crore per annum.

## CBRI develops Underground Horizontal Boring Machine

TRENCHLESS construction is a method of laying underground facilities without disturbing the surface structure. It limits the amount of excavation and the surface repairs needed after digging. At present, the installation, inspection, repairs and replacement of underground utilities involve open trenching construction method which is expensive and slow. The additional cost is also incurred to restore the existing surfaces and repairs resulting from the ground settlement. The most versatile and the popular method of trenchless construction is the horizontal directional drilling. As no small capacity machine is being manufactured indigenously, a project for the development of a small capacity underground horizontal boring machine workable for building industry has been taken up at the **Central Building Research Institute (CBRI), Roorkee.**



Under this project, CBRI has designed and developed a prototype underground horizontal boring machine having salient features as boring diameter-160 mm and boring length up to 8.0 metres. The machine is capable of making horizontal bores under the ground at any required depth. The developed machine carries out the underground job reliably and effectively and can cater to the needs of small to medium contractors engaged in building and allied construction activities such as sewer pipe lines, conduits, electric cables, water pipe lines etc. under buildings and roads with the following major advantages :

- Environmental issues are minimized
- No hindrance to the activities going on at the surface
- Safety concerns associated with open cutting are eliminated and
- Fast and economical.



A view of underground horizontal boring machine

### Patents sealed/filed Abroad/in India by IIP

**T**HE patents sealed/filed abroad/ in India by the Indian Institute of Petroleum (IIP), Dehra Dun, in the recent past include:

#### Patents Sealed

##### Abroad

- A process for preparation of vanadyl pyrophosphate catalysts with improved structural characteristics for selective oxidation of butane to maleic anhydride, A. Datta, S. Dasgupta and M. Agarwal, South Korea, Patent No 9-5-2007-001250416, dt 19.1.2007
- Process for preparing vanadyl pyrophosphate catalyst, A. Datta, S. Dasgupta and M. Agarwal, Australia, Patent No 2003200849, dt 1.2.2007

##### In India

- A process for preparation of bio-fuel, V.K. Bhatia, R.P. Badoni and K.V. Padmaja, Patent No 199686, dt 22.9.2006

- A process for preparation of microporous crystalline titanium silicate, Prashant Kumar, C. Murali Dhar, S. Suresh and T.S.R. Prasada Rao, Patent No 199836, dt 6.10.2006
- A process for preparation of fluid catalytic cracking (FCC) catalyst, Uma Shanker, R.P. Badoni, M. Upadhyay, Neeraj Atheya, Moolchand, Babulal, S.D. Bhagat, R.P. Mehrotra and T.S.R. Prasada Rao, Patent No 202354, dt 24.11.2006
- A process for making impregnating pitch from FCC recycle stocks of waxy crudes, Himmat Singh, Manoj Srivastava, I.D. Singh, P.K. Mukhopadhyay and T.S.R. Prasada Rao, Patent No 199693, dt 8.12.2006

#### Patents Filed

##### Abroad

- Process for preparing fatty acid alkyl esters suitable for use as bio-diesel, A.K. Gupta, A.K.

Bhatnagar and Savita Kaul, Malaysia: PI-2006-3197, dt 5.7.2006

- A process for metal working fluid from heavy alkylate, A.K. Singh, O.N. Anand and A.K. Gupta, Canada: 2561351, dt 26.9.2006; Australia: 2005226654 PP, dt 26.9.2006; South Africa: 2006/8381, dt 9.10.2006; Europe: 2005718959, dt 23.10.2006 & South Korea: 10-2006-7022352, dt 26.10.2006

##### In India

- An improved preparation procedure for noble metal, three-way, auto exhaust catalyst, having a high activity and a longer life, for loading on a commercially available ceramic cordierite honeycomb monolith, V.S. Dangwal, A.K. Jain and L.D. Sharma, application number 0267NF2005 dt 21.3.2007
- A process for making petroleum-derived impregnating pitch from

vacuum residue distillates, Manoj Srivastava, R.S. Kaushik, Susanta Mandal, Manoj Kumar, S.N. Sharma and M.O. Garg, application number 0266NF2005, dt 21.3.2007

- A new eco-friendly sprayable girth gear lubricant for cement plants, R.P.S. Bisht, Savita Kaul, V.R.K. Sastry, B.M. Shukla, Ajay Kumar and A.K. Bhatnagar, application number 0265NF2005, dt 21.3.2007
- A process for production of ethanol from starch, D.K. Adhikari, Tsering Stobdan, R.P. Singh and A.K. Gupta, application number 0116NF2006, dt 21.3.2007
- A process for production of phenol by liquid phase selective hydroxylation of benzene using hydrogen peroxide as the oxidant, vanadyl pyrophosphate as the catalyst, Arunabha Datta, S. Sakthivel and Jitendra Kumar Satyarthi, application number 0294NF2006, dt 21.3.2007

## Studies on MgO, ZrO<sub>2</sub> based Mixed Oxide Supported Hydrotreating Catalysts

**Dr Manoj Kumar**

**Indian Institute of Petroleum, Dehra Dun**

**R**EFINING of petroleum feed stocks is an important process to produce environment-friendly liquid fuels and oils. Feed stocks today are becoming heavier and contain more sulphur. At the same time environmental regulations are becoming more stringent. To meet these challenges, highly efficient catalysts are required. Generally Mo, W metals supported on alumina and promoted by Co, Ni are used as hydrotreating catalysts. Catalytic efficiency of these catalysts can be enhanced by using supports with better physico-chemical properties than conventional  $\gamma$ -alumina.

In the studies carried out by Manoj Kumar of Indian Institute of Petroleum (IIP), Dehra Dun, various combinations of ZrO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub> and MgO-Al<sub>2</sub>O<sub>3</sub> mixed oxides were prepared by urea hydrolysis method as support for hydrotreating catalysts. Mo and W catalysts promoted by Co and Ni were prepared on selected supports by incipient wetness method. All the supports and catalysts were characterized for their physico-chemical properties using different analytical techniques. Activity tests were carried out in a fixed bed plug flow glass micro-reactor at atmospheric pressure using model compounds.

Pore size distributions of (1:1) ZrO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub> and (1:1) MgO-Al<sub>2</sub>O<sub>3</sub> changed entirely as compared to their component oxides and showed a bimodal type pore size distribution. Alumina proved to be a textural promoter for these mixed oxide supports.

There are several hypotheses to describe the mechanism of acidity generation in mixed oxides. Among the hypotheses, Tanabe *et al* hypothesis was applied because it is applicable to amorphous binary oxides and its validity is 90%. ZrO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub> and MgO-Al<sub>2</sub>O<sub>3</sub> mixed oxides prepared by urea hydrolysis method are amorphous in nature. Efforts have been made to calculate excess charge on mixed oxide surface. Theoretically, ZrO<sub>2</sub>-rich mixed oxides possess +1 charge and Al<sub>2</sub>O<sub>3</sub>-rich mixed oxides possess 4 charge. This ZrO<sub>2</sub> rich mixed oxides have Lewis acidity whereas Al<sub>2</sub>O<sub>3</sub>-rich mixed oxides have Bronsted acidity. Total acidity increases proportionally on incorporation of ZrO<sub>2</sub> into the matrix of Al<sub>2</sub>O<sub>3</sub>. MgO is basic in nature; its mixed oxides with alumina showed a decrease in total acidity with an increase in MgO content. It seems to follow the simple acid-base neutralization mechanism. Generation of acidity in mixed oxides on variation of composition starts from weak to strong acid sites whereas neutralization takes place from strong to weak acid sites. Strong acid sites present in ZrO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub> mixed oxides and total acidity of MgO-Al<sub>2</sub>O<sub>3</sub> mixed oxides were found to be in good agreement with cumene cracking activity.

Surface area data and activity results showed that 8 wt% Mo is sufficient to form the monolayer of MoO<sub>3</sub>, on both the mixed oxides surfaces. Temperature-Programmed Reduction (TPR) results showed that the



ratio of hydrogen consumption of the first peak to the second peak is 1:2, which indicates that the oxidation state of Mo metal changes from  $\text{Mo}^{6+} \rightarrow \text{Mo}^{4+}$  in the first step and from  $\text{Mo}^{4+} \rightarrow \text{Mo}^0$  in the second. Monolayer of  $\text{MoO}_3$  on both the oxides was also detected by TPR data and results corroborated by other techniques. Mo support on both the mixed oxides showed that low temperature oxygen chemisorption values increase with Mo content up to 8 wt% loading. Afterwards a decrease was noticed. Hydrodesulphurization (HDS), Hydrogenation (HYD) and Hydrocracking (HYC) activities were in good agreement with low temperature oxygen uptake values. This indicates that anion vacancies which are responsible for oxygen uptake are also an active centre for HDS, HYD and HYC catalytic functionalities. Co (3 wt%) was found to be the optimum amount to promote 8 wt% Mo support on both the mixed oxides. Results showed that 19 wt % W is sufficient to form the monolayer of  $\text{WO}_3$  on the surfaces of both the mixed oxides. The monolayer of  $\text{WO}_3$  on both the mixed oxides was also determined by studying metal support interactions and hydrogen consumption data generated by TPR results. TPR results showed strong metal-support interaction between W metal and mixed oxides supports and also indicated that W reduces in two steps ( $\text{WO}_3 \rightarrow \text{WO}_2$  and  $\text{WO}_3 \rightarrow \text{W}$ ) and most of the reduction takes place in the second step. Low-temperature oxygen uptake, dispersion of  $\text{WO}_3$  on surface, equivalent tungsten surface area, surface coverage and catalytic activity for HDS, HYD and HYC reactions increase with an increase in W loading up to monolayer. Afterwards, a decrease was observed. A good correlation has been found between Low-Temperature Oxygen Chemisorption (LTOC) and catalytic functionalities of HDS, HYD and HYC for both the systems. The activity for different catalytic functionalities follows the trend as  $\text{HYD} > \text{HDS} > \text{HYC}$  for  $\text{ZrO}_2\text{-Al}_2\text{O}_3$  system whereas for  $\text{MgO-Al}_2\text{O}_3$  the trend is  $\text{HDS} > \text{HYD} > \text{HYC}$ . Ni (3 wt%) was found to be optimum to promote 19 wt% W support on both the mixed oxides.

Based on these studies, Shri Manoj Kumar, published six research papers in the leading journals in the area of catalysis and submitted a thesis to the H N B Garhwal University, Srinagar (Garhwal), from where he was awarded Ph.D. Degree in January 2007. The Ph.D work was supervised by Dr G.Murali Dhar, Scientist, IIP.

## Interaction Meet of Unorganized Sector of Artisans with S&T Institutions and Rural Development Agencies including Panchayats

**T**HE unorganized sector of workers constitutes an important component of Indian population, specially the rural population. A noticeable aspect is the existence of a segment of rural artisans in this sector. These artisans on one hand, are regarded as the custodians of the heritage of India, and on the other, play an important role in the village-life through their services. This informal sector possesses vast potential for opening up employment opportunities, generation of income, and strengthening of the purchasing power of the rural population.

The main cause behind not reaching the fruits of S&T developments to these artisans is their non-involvement in the rural development programmes. A large number of technologies generated in the R&D institutions of our country have largely been accessible to only a small number of people. Secondly, these artisans are resource-poor and cannot afford skill upgradation at the cost of their livelihood earning. Their weak communication power is another hindrance in their skill/technology upgradation. As a result, the overall goal of improving the quality of life of rural people has been far from satisfactory.

Recognizing the significance of the role of rural artisans in shaping the growth and development of the country, the National Institute of Science Technology and Development Studies (NISTADS), New Delhi, undertakes 'S&T studies for weaker sections of the society with a focus on rural artisans and urban poor'. It functions as a bridge between artisans on one hand and R&D personnel, and rural development functionaries on the other. Several

such studies have been carried out by the scientists of NISTADS. An Interaction Meet of Unorganized Sector of Artisans with S&T Institutions and Rural Development Agencies including Panchayats, organized on 15 June 2007, was another such attempt and was undertaken on the occasion of NISTADS Silver Jubilee Celebrations.

The Interaction Meet had following objectives:

- **A w a r e n e s s** generation among rural artisans regarding: (a) Technology upgradation, (b) Skill development, (c) Marketing and value-addition of their products, (d) Schemes of different Grameen Banks and Regional Banks for the welfare of rural people, and (e) Schemes of different Government agencies for the welfare of rural people including artisans.
- How panchayats, as a part of rural life, can help improve the socio-economic conditions of the rural artisans.

A special feature of this Meet was that more than 40 artisans belonging to the unorganized sector in Haryana and some *sarpanchs* and members of *Panchyats* from Haryana and Rural Delhi actively participated in the celebrations, which were conducted in Hindi and



Prof. Gajender Singh, Vice Chancellor, Doon University, Dehra Dun, delivering the inaugural address. Others seated on dais (from left) are: Dr P. Banerjee, Director, NISTADS, Shri S. K. Rastogi, Director, NISCAIR, Shri S.S. Solanki, Scientist, NISTADS and coordinator of the Interaction Meet

at times, in Haryanvi Hindi. Notable among the other participants were scientists of CSIR and IARI, representatives of NGOs and developmental institutions like NABARD, KVIC, Cooperative Bank, technicians, and social reformers, etc.

Dr P. Banerjee, Director, NISTADS, in his welcome address, observed that rural artisans constitute an important segment of village life but their socio-economic status has deteriorated with time. There is a need to improve their techno-economic and socio-economic conditions. He added that NISTADS has provided a platform to the artisans and various rural development functionaries for a face-to-face interaction.

In his inaugural address, Prof. Gajender Singh, Vice Chancellor, Doon University, Dehra Dun, observed that artisans were pivot of

village life at one time. The introduction of high technology compelled the talented artisans to migrate to urban areas in search of livelihood. He informed that there were 600-700 Industrial Training Institutes (ITIs) in India, practically one in each district of the country. But, their plight was miserable owing to lack of good teaching faculty and the needed infrastructure. He suggested that each ITI should introduce cluster-specific courses

at the earliest and wards of artisans should be given preferential admission to these courses. These courses should be linked to the professional requirement of the cluster. This will help the artisans in securing employment and provide trained manpower to the workshop-owners.

In the context of marketing, Prof. Singh suggested to follow the 'Thailand Model', which is based on the hypothesis of One Product, One District. In this model, one best product is identified from each district, which is marketed across the country and outside by the Thai government. Such an arrangement by the Government of India will be highly beneficial to the artisans of the country and will largely increase visibility of their products within and outside the country.

Shri S. K. Rastogi, Director, National Institute of Science



Communication And Information Resources (NISCAIR), New Delhi, while praising the efforts of NISTADS in rural development, observed that in the present age of information technology, we should try to increase the access of rural artisans to information so that they could improve their products and expand their marketing channels.

Shri S.S.Solanki, Scientist, NISTADS and Project Leader of the project entitled “Technology Upgradation of Traditional Skills of Rural Artisans through Information, Training and Adoption of Science and Technology”, highlighted the major problems of the rural artisans and pointed out the role of NISTADS in solving these problems.

The inaugural session was followed by four technical sessions on: (i) Technology upgradation, (ii) Skill development, (iii) Financial resources, and (iv) Marketing and information, and finally, the valedictory session.

Information on technology and skill upgradation was provided by Dr A.P. Srivastava and Dr Indra Mani, Principal Scientists at Division of Agricultural Engineering, IARI, New Delhi and Dr Dushyant Singh, Scientist at Central Institute of Agricultural Engineering, Bhopal. The artisans were asked to rise to the occasion and to upgrade their technology through training. They were told that they would have to go beyond manual manufacturing to face the competition in the new regime of globalization, otherwise their products may lose to the imported products. They were also advised



Prof. S.K. Joshi, former Director General, CSIR and Chairman, Research Council, NISTADS, delivering his Valedictory Address. Also seen (from left) are: Shri Ram Niwas Mirdha, Chairman, Sangeet Natak Academy; Dr P. Banerjee, Director, NISTADS; and Shri S.S. Solanki, Scientist, NISTADS

to introduce standardization in their products to maintain quality. Information was also provided on different types of trainings being imparted by both IARI, New Delhi and CIAE, Bhopal, in which artisans showed keen interest.

Awareness about financial and marketing aspects was generated by Shri Shiv Raj Singh, Manager, Central Cooperative Bank, Rohtak; Shri Raj Kumar, Deputy General Manager, NABARD, Rohtak; and Shri H.P. Khatri, Director, KVIC, Ambala Cantt. Each of them explained in details the various schemes of their respective institutions to grant loans to the rural artisans. Finance being a critical input to the development of rural artisans, it was a matter of satisfaction to them that there were

schemes under which they could get loan without any collateral security, which they usually don't have. The artisans were surprised to learn that KVIC even gives subsidies up to 30% on certain types of loans.

Shri Raj Kumar of NABARD emphasized on the need of 'financial education' to the artisans. He observed that the lack of financial awareness among these people was the main cause of their professional backwardness. He called upon the artisans to jointly work together in the cluster development and NABARD will extend all possible help — financial, technological or training.

Dr R.S. Saxena, Scientist, CSIR, New Delhi, outlined some of the technologies developed by CSIR for the rural people. He informed

that CSIR has developed a kit for the artisans, to manufacture tools and implements having better performance qualities.

Shri Parvinder Pal of Foundation for Marginal, Small and Medium Enterprises Clusters, New Delhi, remarked that artisans usually remain confined to their traditional technologies, products, style of working and markets. He showed a film on *bunkers* of 'Chanderi Sarees', depicting their success story through cooperation, confidence generation and adoption of newer designs and marketing methods.

Retired Subedar Shri Rati Ram, *Sarpanch*, stressed the need of training and observed that it not only provides the key to success but also generates confidence. He suggested that artisans should bring diversification in their products by adopting the related fields of vermiculture, honeybee-rearing, etc. Shri Raj Pal observed that 'Indian artisan' symbolizes India and it is necessary to provide financial support to him to keep Indian heritage alive. He suggested that for the marketing of artisanal products a new institution on the pattern of Khadi Gramudyog may be established. Shri Tek Ram, artisan and social worker, Sampla, Rohtak, narrated the historical development of Sampla cluster and outlined the problems being faced by the artisans.

At the Valedictory Session, Shri Ram Niwas Miradha, Chairman, Sangeet Natak Academy and ex-Central Minister, who was the Chief Guest, suggested that the introduction of cluster-specific courses in ITIs for the younger

generation and part-time courses for the elder artisans for their skill upgradation will be very useful. He emphasized on the introduction of 'Artisans Credit Cards' on the pattern of 'Kisan Credit Cards', to provide financial loans, etc. to them. He called upon the financial institutions to concentrate on 'micro-financing' to strengthen the micro-industrial sector in the rural areas. Shri Mirdha also suggested to revive the extension services, though in a well-organised manner, to generate awareness in the rural areas on the needed subjects.

Prof. S.K. Joshi, Chairman, Research Council, NISTADS and former-Director General, CSIR, outlined some of the major contributions of CSIR to rural development. He observed that though rural population constitutes 70% of India's population, its contribution to national GDP is only 28%. He emphasized the need of introducing urban facilities in the rural areas also to upgrade their standard of living and to check rural to urban migration.

Chaudhary Ram Karan, Head, 360-villages, Palam, Delhi, observed that education and technical training to the artisans were the only steps that could bring prosperity to them. He suggested to the artisans to form self-help groups (SHGs) to take advantage of different schemes being promulgated by the government.

#### **The following recommendations emerged from the meet:**

- Some cluster-specific courses should be introduced in the

Industrial Training Institutes (ITIs), as for example, ITI (Rohtak) should introduce a course on artisanal engineering/technology. The wards of the artisans should be given preferential admission in these courses.

- Some part-time courses should be introduced to help the artisans in improving their skill.
- Artisans Credit Cards should be introduced on the pattern of Kisan Credit Cards.
- Trainings should be organized in/by appropriate institutes on a regular basis for the artisans to upgrade their technology and refine their skill.
- Awareness generation camps should be organized by various agencies associated with the rural development, particularly by the financial institutions, say on quarterly basis.
- Self-help groups (SHGs) should be established to utilize the advantages being offered by the government through its various schemes and for the overall development of the cluster.
- The rural developmental institutions should involve the artisans/rural people in all the developmental schemes.
- 'Artisan Melas' should be organized like 'Kisan Melas' at the district level to provide help in marketing and generate wider awareness in the rural masses.



### International Workshop on Composition of Asian Atmospheric Deposition

**A**N International Workshop under the Composition of Asian Atmospheric Deposition (CAD) programme was held at the Indian Institute of Chemical Technology (IICT), Hyderabad. CAD programme is a part of the IGAC/DEBITS activities of the International Geosphere Biosphere Programme (IGBP). The objective of the programme is to bring together experts from Asia, Australia, Europe and North America to discuss air pollution and ecological problems of common interest, and to provide capacity building opportunities to the scientists in South and South-east Asia. The activities of CAD have been financially supported by SIDA (Swedish International Development Cooperation Agency) as part of the 2004-2007 phase of the Regional Air Pollution in Developing Countries (RAPIDC) Programme. This programme is being mentored by Professor H. Rodhe, Director, International Meteorological Institute (IMI), Stockholm University, Sweden.

Dr A.C. Kunwar, Scientist G, IICT, welcomed the delegates arrived from foreign countries and various cities in India. A total of 12 participants from Australia, Bangladesh, Japan, Nepal, Norway, Singapore, Sweden, Thailand, UK, USA and 22 from India attended the workshop. The participants from

India included senior Indian experts like Prof. B.L. Deekshatulu, Dr SagarDhara, Dr D.R. Lakshmi, Dr R. Rajamani, Dr P.R. Reddy and Dr B.M. Reddy. Dr Kunwar in his opening remarks highlighted the importance of acid rain and global climate change and their consequences on the planet earth.

Dr J.S. Yadav, Director, IICT, and Prof. H. Rodhe, Director, IMI discussed the importance and future scope of the atmospheric deposition studies.

During the three days' workshop, discussions were held on various topics like deposition chemistry in different Asian countries, smoke haze in south-east Asia, long range transport and modeling, atmospheric aerosol chemistry, ozone monitoring and modeling, environmental impact assessment of Asian soils by acidic deposition and biogeochemical significance of atmospheric depositions. Dr U.C. Kulshrestha, Scientist, Analytical & Environmental Chemistry Division, was the convener of the workshop.

The workshop concluded with the following points:

- The nature of rain water in India is alkaline having no immediate serious threat to ecological system. However, continuous measurements should be carried out at certain selected sensitive sites in SW, NE,

Himalayan region and north-central parts of India in order to understand the role of increasing emissions of sulphur and nitrogen.

- So far no obvious biological effects due to acidification of soils have been observed in Asia. The only possible exception being the defoliation observed at two sites in SW China.
- The CAD scientists should make efforts to utilize Atmospheric Chemical Transport Models (ACTM) and/or air trajectories in their evaluation and interpretation of measurement data.
- It was suggested that standard samples be prepared for use in the CAD analyzing laboratories in the calibration processes. Intercomparison of chemical analysis should be done by participating in various networks. Till any national network starts for rain water analysis inter comparison, CAD members should participate in international networks like GAW (WMO) or EANET (Japan).
- There is an urgent need to measure dry deposition to vegetation surfaces in Asian countries.

## Golden Jubilee Celebrations at NEERI

**T**HE National Environmental Engineering Research Institute (NEERI), Nagpur, has entered into its fiftieth year of foundation on 8 April 2007. The institute has planned several scientific events to celebrate the golden jubilee year.

The celebrations were launched at a function held on 8 April 2007. Dr T. Ramasami, Secretary, Department of Science and Technology, Government of India and Director General of Council of

Scientific and Industrial Research (CSIR), was the Chief Guest on this occasion.

Speaking at the inaugural function, Dr Ramasami briefed about the importance of the National Environmental Engineering Research Institute for the society and nation. He appreciated the R&D activities carried out so far at the institute, which helped in creating environmental awareness in the country. But NEERI has much

larger role to play in the future, he added. Addressing to three generations of scientists at NEERI, who were present on this occasion, i.e. the ones who formed the institute, the ones who are running it and the ones who would be heading it a decade later, Dr Ramasami said that all should work together for adding more value to the existing stature of NEERI. It would be a matter of pride for India that by 2020 its younger generation of



Dr T. Ramasami, Director General, CSIR, at various units of the institute



scientists would create an unprecedented space in the world's scientific community. Dr Ramasami said that India is emerging as a R&D hub and in this context NEERI has a wider role to play in the field of environmental science and engineering. He advised that NEERI should act like a custodian for environmental security of the country. Citing an example of the leather industry, Dr Ramasami said that prior to 1995, the apex court ordered to close down 400 tanneries in Tamil Nadu, since the pollution control norms were not met by the tanneries. As a result, the people working in this industry became unemployed and their families started suffering. In such difficult situation, NEERI and the other institutes came forward for establishing common effluent pollution treatment plants, and thus, the problem was resolved. He advocated that the scientists should do such kind of novel work to save our people, society and the nation.

Earlier, while delivering the welcome address, Dr Sukumar Devotta, Director, NEERI, traced the history and activities of the institute from 1958 onwards and listed the landmark achievements of the institute. He said that NEERI made a modest beginning from a small rented place as Central Public Health Engineering Research Institute (CPHERI) and now it has emerged as an agency supporting the judiciary in implementing environmental regulations. Besides conducting R&D activities in the field of environmental science and engineering, the institute also drives societal missions for the people and

acts as a problem solving body for various industries, he added. Dr Devotta said that the institute has been successful in maintaining a balance between R&D and consultancy projects. The institute is working on a number of projects with UNEP, UNICEF and WHO, he informed. Dr Devotta informed that NEERI is taking up a big project in Kalpasar, which is related to creation of India's biggest freshwater lake in sea, in Gujarat.

During the programme, various awards were given to NEERI scientists. The award for 'Best R&D Division' was given to Environmental Materials Unit (EMU), which was received by Dr (Smt.) Sadhana Rayalu, Scientist and Head, EMU. The award for generating maximum external cash flow (ECF) was conferred to Environmental Impact and Risk Assessment (EIRA) Division. This award was received by Dr S.R. Wate, Scientist and Head, EIRA Division. The 'Best Paper Award' was given to Dr K. Krishnamurthy, Scientist, Environmental Biotechnology Division. The 'Best International Patent Award' was given to Dr Hemant Purohit, Scientist and Head, Environmental Genomics Unit.

The golden jubilee souvenir of the institute was released on the occasion. Prof. S.J. Arceivala and Dr R.N. Singh, former Directors of NEERI; Dr Deepak Kantawala, ex-Chairman, NEERI Research Council and Dr S.N. Kaul, former Scientist and Head, WWT Division, NEERI were felicitated on this occasion.

Dr T. Chakrabarti, Director

Grade Scientist, NEERI proposed a vote of thanks. The programme was compered by Dr (Smt.) Atya Kapley, Scientist, NEERI.

To mark the occasion, a series of lectures were organized in the institute on 9 April 2007. In the first lecture, Prof. Arceivala briefed about water conservation and its reuse in India. He said that water is becoming critical in India. Hence, water conservation measures today have to be borne by public water supplies and industries, he added. Prof. Arceivala remarked that the concept of reuse has been developed in India from 1982, which was initially for agriculture and horticulture, and subsequently in industries to meet chronic shortages in public water supplies. From 1998 onwards the concept of reuse has been applied for community development and augmentation of public water supplies. Prof. Arceivala also drew attention towards the new role of scientists and engineers for developing cleaner technologies for industries and for augmentation of water resources for public use. To conserve water resources, Prof. Arceivala suggested to encourage rainwater harvesting, wastewater harvesting, reuse as a policy in industries and zero discharge.

Dr R.N. Singh, CSIR Emeritus Scientist, National Geophysical Research Institute, Hyderabad, delivered a lecture on 'Measuring Sustainability'. Dr Singh gave details about four facets of sustainability including protection of the environment. He said that an effective model is needed for measuring sustainability. Describing

about mathematical metaphors in science, Dr Singh said that as science advanced to capture reality, new metaphors have been developed. He specifically threw light on the metaphors related to sustainability.

Dr Deepak Kantawala, former-Chairman, Research Council, NEERI discussed the state of the environment. Speaking about the National Environmental Policy (NEP), Dr Kanatawala opined that to be more effective there is need to formulate a National Environmental Plan. Because plan provides objectives, targets and time frames, while policy is only one of the enabling instruments of implementing the plan. In this context he informed that the work of formulating environmental plan has been initiated by the Enviro Control Group of Companies, Surat. The plan includes water, air and land environment, he added.

Shri P.N. Devrajan, former-Chairman, Research Council, NEERI delivered a lecture on 'Environment, Economy and Equity'. He stressed the need to relate environment and economy of the country. He advised the NEERI scientists to take up new and challenging issues coming up in the field of environmental science and engineering. Shri Devrajan specifically highlighted the issues regarding sustainability, nanotechnology and E-waste management and urged the scientists to provide innovative ideas in these areas.

A cultural programme was also organized on the occasion.

## Prof. V.P. Dravid delivers Prof. McBain Memorial Lecture at NCL



Prof. Vinayak P. Dravid, delivering the Lecture

**P**ROF. Vinayak P. Dravid, Materials Science & Engineering Department, and also the Director, Northwestern University Atomic and Nanoscale Characterization Experimental (NUANCE) Center and Founding Member of International Institute for Nanotechnology North-western University, Evanston, USA, delivered the seventh Prof. J. W. McBain Memorial Lecture at the National Chemical Laboratory (NCL), Pune, on 23 July 2007. Prof. McBain, the first Director of NCL (1949-1952), was an authority in the area of surface and colloid chemistry. He held the view that the production of basic chemicals in India is a key to the country's industrialization and progress. Prof. Dravid's lecture was titled, 'Some assembly required: Self-, directed- and hierarchical-patterning of nanomaterials and

assembly of functional nanostructures'. The lecture was organized by The NCL Research Foundation (NCL RF), a non-profit public trust supported by a corpus of generous donations made by individuals and companies, which honours those men and women who have made NCL proud.

Prof. Dravid began his lecture with the architecture of fullerene molecule, named after Buckminster Fuller, to illustrate that the combination of pure geometrical forms across the length scale triggered the imagination of scientists and engineers. Prof. Dravid compared the behaviour of molecules and aggregates with reference to change in phenomena and appearance with that of the galaxies, pointing out that the knowledge about astronomy was linked to information available from modern microscopic techniques.



Dr S. Sivaram, Director, NCL, giving his welcome remarks

Prof. Dravid beautifully highlighted the creation, evolution and design of many fascinating materials which had already taken place a few centuries ago, illustrating the role of nanostructured colloids in controlling optical properties of many traditional structures. Giving an example of transistor that was discovered in 1947, which took decades before its complete translation to technology, he stated that the real bridge between science and technology was engineering. Most scientists do science but talk about technology. According to him, engineering is the bridge which links science to technology. Science is creativity without constraints, but technology can be termed as creativity with constraints. Prof. Dravid pointed out that it takes considerable efforts to translate science into technology. He went on to exemplify the fact that the field of nanoscience was not really new. He cited the example of colloidal gold which changed into different colours depending on the size and shape of the gold nano-structures which can be observed by a modern

bacteria which creates magnetic nanostructures at its belly. He also referred to carbon nanostructures which looked like meteoroids and have been around for a long time and cooling at the rate of one degree per many million years, thus being the most equilibrated structures.

Prof. Dravid spoke about the tools and techniques that were available in mid-1980s, among which the scanning probe microscope (SPM) was the notable one. Areas such as size selective synthesis and nanofabrication have become so sophisticated that one is now able to create highly tunable nanostructures through chemical means using either organic or inorganic agents. Computational tools and

day transmission electron microscope (TEM). Further, he stated that nanostructures are ubiquitous in nature. Examples are bacterial rhodopsin and magnetotactic

techniques have advanced by leaps and bounds in the last two decades. In these days it is not unusual to model a complete nano system with every atom accounted for. Prof. Dravid brought forth the importance of biology by saying that while the last century was the era of quantum mechanics and information technology, the current century will undoubtedly be influenced, if not dominated, by biology. During the last two decades, understanding and recognition of biology tools and structures has come a long way with human genome project and proteomics. This combination has led to the resurgence of nanoscience and technology and has ushered on an entirely new era. The convergence of these disciplines, and more importantly, the 'out of the box' thinking has given lot of push for new business.

Prof. Dravid highlighted the origin of nano related research at his institute which had significant strength in nanotechnology even



Dr Sourav Pal, Head, Physical and Materials Chemistry Division of NCL, offering memento and bouquet to Prof. Dravid

before the launch of the National Nano Initiative (NNI) of National Science Foundation (NSF), USA. The International Institute for Nano and Molecular Medicine, Center of Cancer Nanotechnology Excellence, The Chicago Materials Research Center funded by the NSF as one of their Materials Research Science and Engineering Centers (MRSEC) address the problems of technological significance, thereby, giving a muscle to move forward. He also advised the young students that even if they wish to opt for an engineering career, not to give up biology at an early stage of schooling. He said that, 'If you wish to do serious science in future then biology is going to be one of the areas that will interface with physical science as well as engineering'.

Prof. Dravid concluded his talk saying that there are great expectations from microelectronic chip. A cell phone which was initially used only for communication purpose is being increasingly used for other applications, such as, sending s.m.s., accessing video, etc. One of the key understandings that the younger generation must pay attention to is the fundamentals of nucleation and growth of nanoparticles. Advancement in science always throws new challenges in its wake. He called these the 'Valley of Death'. Issues such as genetically modified food, ethical issues of handling embryonic stem cells and environmental impact of nanomaterials are crucial to the progress of emerging science. These issues can not be pushed under the rug and should be understood and appreciated in the context of the ethics of science. Prof. Dravid referred to Prof. McBain's motto displayed at NCL entrance lobby and exhorted the younger generation to not only study science but also understand its impact on society at large.

Earlier, Dr S. Sivaram, Director, NCL, welcomed Prof. Dravid and also the audience and introduced Prof. Dravid to the audience. He remembered the contributions of Professor and Mrs McBain to NCL. A video clipping of inauguration of NCL at the hands of Pandit Jawaharlal Nehru, the first Prime Minister of India and some photographs of Prof. McBain were also shown on the occasion.

Dr Sourav Pal, Head, Physical and Materials Chemistry Division of NCL proposed the vote of thanks.

## 'Are there different ways of doing science' Lecture by Prof. Roddam Narasimha

THE word 'Science', although commonplace in usage and apparently obvious in its meaning, becomes highly contentious when philosophers or scientists of different intellectual camps attempt to interpret it. Prof. Roddam Narasimha brought out some aspects of this debate in his birthday lecture at the National Aerospace Laboratories (NAL), Bangalore. The lecture titled 'Are there different ways of doing science?' had as its premise that there are at least two ways of doing science — the Greek and the Babylonian. Prof. Narasimha in his characteristic style built up the arguments by directly presenting the views of scientists, scholars and philosophers along the course of history.

The Greek method, he said, is one of 'first principles', or essentially an axiomatic approach. One starts with axioms or propositions that are taken as self-evident and indisputable. Then, by applying logical operations on these axioms, conclusions are derived or deduced. The emphasis here is on the consistency of the logical operations and its proof. The Babylonian method on the other hand is one of 'relating one thing to another', borne out of observation and intuition. The emphasis in this method is not on the probability of the method but rather on the validity with respect to observations. The Indian way of thinking and doing science, Prof. Narasimha insisted, is closer to the Babylonian method. He then went further to rally the two camps, and pitted one against the other, each camp led by formidable Generals: Dirac vs Feynman, Einstein vs Euclid, Hardy vs Ramanujam, Ptolemy vs Aryabhata, and so on.

The mathematician S. Ramanujam, for example, developed theorems for which there was 'no strictly logical justification' and was based on a 'mixture of evidence and intuition', in the words of the British mathematician Littlewood. Prof. Narasimha cited Indian texts and scholars to reinforce the point that the Indian way of thinking has largely been algorithmic with the intent to be able to predict correctly. Thus, the results, in addition to agreeing with intuition, should also be validated with observations. Another



point made by Prof Narasimha is that this is not strictly an East vs West issue. The Dutch mathematician Brouwer, was guided by this mode of thought and is in fact the father of the branch of logic termed as Intuitionist Logic. The fact that he had read and was influenced by the *Bhagavad Gita* was an interesting piece of detail. Feynman, the great American physicist and a self-professed Babylonian, also used methods for which there was no proof that they were right, but were used nevertheless because they worked! Schwinger, who shared the Nobel Prize with Feynman, called him an 'outstanding intuitionist'. Einstein was also disturbed by the certainty assumed by the Euclidean axioms.

Prof. Narasimha thus asked 'how do we know what we know is right?' Is it based on proof, observation or intuition? Or a blend of these? Analyses on the philosophy, history, methodology or sociology of science are often coloured with politics, polemics or dense jargon. This lecture was a delightful exception. Also, for someone fed on mainly western fare (simply due to more accessible English translations), Prof. Narasimha's lectures possessed the additional charm of providing an insight into Indian thought and culture.

### **Dr Harinarayana elected- Member of Russian Academy of Natural Sciences, Moscow**

**D**R T. Harinarayana, Scientist, National Geophysical Research Institute (NGRI), Hyderabad, has been elected as a member of Russian Academy of Natural Sciences (RANS), Moscow, on 13 June 2007. Dr P.K. Shukla, Scientific Councilor, Indian Embassy at Moscow, was also present on the occasion. Dr Harinarayana is presently handling projects related to Hydrocarbon and Geothermal Exploration, Deep Crustal Studies, Marine Magnetotellurics Studies and also earthquake and tsunami studies. He was a visiting Professor at Earthquake Research Institute, University of Tokyo, Japan, during 2004. He is currently a member of several international and national scientific committees.

Dr Harinarayana is a recipient of prestigious National Mineral Award in 1991 of Government of India and has published more than 70 publications and reports. He has two Ph.D. degrees in earth sciences – one from Indian School of Mines, Dhanbad, and the other from University of Edinburgh, UK.

The Russian Academy of Natural Sciences (RANS) elects internationally renowned scientists, professors, and academicians to its body as members. Among these members there are 23 Nobel Prize winners, 124 members of the Russian Academy of Science, 30 members of Russian Academy of Medical Science and 10 members of the Russian Education Academy (RASHN) and a few members of eminent scientists outside Russia.

### **Dr Paran Baruah conferred the Fellowship of Indian Phytopathological Society**

**D**R Paran Baruah, Scientist, North - East Institute of Science and Technology (NEIST) (erstwhile Regional Research Laboratory), Jorhat, has been conferred the Fellowship of Indian Phytopathological Society, New Delhi, for his significant research contributions to plant pathology and related aspects.

A recipient of ASPEE Gold Medal from American Spring and Pressing Works (Bombay), Scroll of Honour from Indian Phytopathological Society and RKB Memorial Science Award from Assam Science Society, Dr Baruah has 27 years of R&D experience in disease control of medicinal, aromatic, horticultural and other plant resources of North-East India, microbial ecology, diversity and resource utilization, biofungicide from North-East Indian plant species and mushroom biotechnology. Dr Baruah has more than 70 research publications in national and international journals of repute, two patents and one book to his credit. A recognised Ph D guide of quite a few Indian universities, Dr Baruah also has academic experiences of teaching microbiology and plant pathology at Assam Agricultural University, Jorhat. Having served as Agricultural Extension Officer under the Government of Assam for quite some time, he has wide experiences of transferring agro-technology to rural masses through training and other means.

## Honours & Awards to IIP Personnel

**T**HE following Honours and Awards have been received by the Scientists/personnel at the Indian Institute of Petroleum (IIP), Dehra Dun:

- Dr M.O. Garg, Director, IIP, has been nominated as Member (ex-Officio) of the reconstituted 'Scientific Advisory Committee on Hydrocarbons' of the Ministry of Petroleum and Natural Gas. Under the Terms of Reference, the Committee is to advise on policies relating to science and technology and measures to implement them in order to ensure optimum processing of hydrocarbon raw material for use as fuels and chemicals.
- Shri A.K. Jain, Scientist 'F', bagged the award for Best Indian Paper on Environmental Pollution for presenting the paper entitled 'Effect of Gasoline Composition on Exhaust Mass Emissions from Two-Wheelers: An Experimental Study' (co-authored by Sunil Pathak, Yograj Singh, Sarabjeet Singh and M. Saxena from IIP and M.Subramanian and P.C. Kanal from (IOC) in the 'Symposium on International Automotive Technology (SIAT 2007), organized by ARAI, Pune; SAE, India and NATRiP at Pune.
- Ms Pratibha Dheeran, JRF, bagged the Best Oral Paper Award for the paper entitled 'Thermostable amylase and its application' (co-authored by Amita Sinha and D.K. Adhikari) at the 'National Conference on Microbial Diversity : Avenues and Applications', organized by the Sardar Bhagwan Singh Post Graduate Institute of Biomedical Sciences and Research, Dehra Dun.

## Dr Subhash Ghosh selected for INSA Medal-2007

**D**R Subhash Ghosh, Scientist, Indian Institute of Chemical Technology (IICT), Hyderabad, has been selected by the Council of the Indian National Science Academy for the award of INSA Medal for Young Scientist (2007), for his outstanding contributions to the field of total synthesis of biologically active natural products, comprising macrocyclic lactones, by employing modern synthetic methods. Dr Subhash Ghosh made significant contribution to diverse areas of organic and bioorganic chemistry like use of sugar amino acids in peptidomimetics and in designing molecules, synthesis of HIV protease inhibitors, total synthesis of natural products, synthesis of glycosidase inhibitors and synthesis of pyrophosphate analogues (bisphosphonates).

Dr Subhash Ghosh did his M.Sc. from Calcutta University, securing first rank, in the year 1996. After that he joined the group of well known Scientist, Dr Tushar Kanti Chakraborty at IICT for his Ph.D. During his Ph.D. he worked in the field of peptide, peptidomimetics and total synthesis of natural products. After completion of his Ph.D. in 2001, he moved to University of Illinois at Urbana Champaign for his postdoctoral studies with Prof. Eric Oldfield, where he worked in the field of medicinal chemistry. He synthesized a library of pyrophosphate analogues namely 1,1-bisphosphonates, aminomethelene bisphosphonates, 1,2-bisphosphonates and tested these compounds against *Entamoeba histolytica* and *Plasmodium* Species *in vitro* and *in vivo*. In 2002 he moved to the University of California at San Diego for his second postdoctoral research with Prof. Emmanuel A. Theodorakis, where he worked on the synthetic studies of norzoanthamine, a promising candidate for anti-osteoporosis. In 2004 he came back to India and joined IICT as a Scientist and started working on the total synthesis of natural products having useful biological activities.

Dr Ghosh has published more than 19 papers in national and international journals.



## Dr M.O. Garg takes over as Director (Additional Charge), CBRI

**D**R Madhukar Onkarnath Garg, Director, Indian Institute of Petroleum, Dehra Dun, has been given the Additional Charge as Director of Central Building Research Institute (CBRI), Roorkee with effect from 23 July 2007.

Born on 17 September 1954, Dr Garg is a gold medallist in B.Tech. (Chem. Engg.) from Nagpur University and M. Tech. in Chemical Engineering from IIT, Kanpur. In 1976, he joined the Research & Development Division of Engineers India Ltd, New Delhi. In 1978 he bagged the prestigious post-graduate research scholarship of the University of Melbourne, Australia where he did his Ph.D and also served on the faculty. He returned to Engineers India Ltd in 1982 and worked in several areas closely linked with the refining industry. In 1994, he joined Kinetic Technology India Ltd, New Delhi, as General Manager (Process Systems Services Division) where he was responsible for providing advanced process-engineering services to the refining industry. In July 1998, he joined IIP as Scientist G and has been its Director since 15 August 2003.

Dr Garg is an acknowledged expert in the area of liquid-liquid



extraction, advanced controls, simulation & modelling and process integration, with specific application to the refining industry. During his career, he has been instrumental in developing and commercializing several large-scale technologies in the area of liquid-liquid extraction in the Indian refineries. He was involved in the successful transfer of advanced control technology to India and its implementation in various refineries. Also, he built strategic alliances with various companies abroad to transfer and implement process integration technologies.

Dr Garg has contributed immensely to the development and growth of the Indian hydrocarbon industry and possesses the unique capability of conceptualizing development and implementation of new research ideas. The

development of RAGE package for data reconciliation and gross error detection is considered as a unique example of successful collaboration between the industry and the academics. He possesses advanced skills in numerical mathematics, applied statistics and linear and non-linear programming and computer system languages.

He has bagged several awards and honours, noteworthy among them being the CSIR Technology Awards for the years 2001 and 1999, given respectively for 'Development of Technology for Production of Food Grade Hexane' and 'Development of Propane Deasphalting Technology'. Apart from this, he also received the CSIR Technology Shield for 'Development of NMP-based refining technology for simultaneous production of quality Lube Oil Base Stocks (LOBS) and high BMCI Extract'. Dr Garg also bagged the 'Uttaranchal Ratan' Award 2004 given by the All India Conference of Intellectuals in the Indian Petroleum Category. He has to his credit over 90 publications in reputed national and international journals. He is also a member of the Editorial Board of the journal *Microporous and Mesoporous Materials* (Elsevier publication).

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