



**IIME-NE Chapter Formation & National Symposium-cum Workshop  
on  
NER Coals & Minerals: Issues, Challenges and Opportunities  
(NECMICO-2014), 30-31 October, 2014**



**Minutes**

North Eastern Region (NER) of India bears a significant amount of mineral resources lying untapped and needs to be mapped in details, characterized, beneficiated and utilized for socio-economic development of the region in particular and the country in general. The diverse geological conditions call for integrated geo-scientific studies to identify and address the gaps of the target areas for best possible sustainable utilization. The Indian Institute of Mineral Engineers is the best platform to address such gaps. Therefore, an Indian Institute of Mineral Engineers-North East Chapter (IIME-NE Chapter) has been formed on the eve of 30th October, 2014, in Jorhat to promote study, practice and disseminate knowledgebase amongst the stakeholders, agencies (Govt./Non-Govt.) for gainful utilization of coal and mineral resources towards sustainable development of the region. The Executive council members elected with Dr. B.P. Baruah as Secretary and Dr. P. Sengupta as President for IIME-NE Chapter is being provided in **Annexure-I**. To mark the occasion, CSIR-NEIST, Jorhat, Assam and IIME-NE Chapter have organized jointly a two-day Symposium-cum-Workshop on “NER Coals & Minerals: Issues, Challenges and Opportunities (NECMICO-2014)” during 30th-31st October 2014. The Symposium-cum-Workshop was organized to disseminate knowledgebase in modern technologies, prospects and challenges in terms of coal and mineral beneficiation and utilization expecting to bring out the most promising issues and pathways for sustainable development. The event also had an Industry-Academia-R&D interaction for optimum utilization of resources of the region and framed out the gaps among resource-technology-policy-market products. It also had deliberations from eminent personalities of international standing, and experts from industrial sector having vast expertise in coal and mineral sector.

In the event, the eminent personalities from the region and across the country deliberated the issues, challenges and opportunities in these sectors. Altogether 13 numbers of technical lectures were delivered by eminent scientists, professors, and experts on the themes viz., Characterization, beneficiation and sustainable utilization of coal and mineral resources and Clean Coal technologies such as Carbonization, Gasification and Combustion. The symposium was followed by panel discussion which brought out an agenda and formulated action points for future course of action to address these gaps. The symposium also had exhibition of scientific posters/papers to disseminate knowledgebase to the students and faculties. The event was supported by a number of industries, institutes and ministries. A souvenir was released during the symposium. A total of 201 participants including registered, invitees, guests of honour, delegates and other invited guests from various educational institutes, industries and experts from Govt., ministries were present in the proceedings. The student participants were given a concession in registration fee etc. for encouragement and motivation.

The proceedings of the event (session wise) recorded are given herein under:

## Inaugural Session Day-1 (30.10.2014)

The inaugural session was held on 30<sup>th</sup> October, 2014 at Dr. JN Baruah Auditorium for opening the IIME-NE Chapter and inauguration of Symposium-cum-Workshop on NECMICO-14. All the dignitaries were welcomed to the dias, briefly introduced to the gathering and felicitated. Prof. T.C.Rao was requested to preside over the inaugural session. Dr. P.G. Rao was invited as the Chief Guest of the event.

- ❖ Dr. B P Baruah, the Organizing Secretary, NECMICO-14, CSIR-NEIST, Jorhat welcomed the distinguished personalities, invitees, faculties and students, industrial representatives by addressing the gathering about the genesis of the Indian Institute of Mineral Engineers, formation of a Chapter at Jorhat to cater to the needs and addressing the gaps existing in coal and mineral sectors towards sustainable development of the region. He also mentioned the essentiality of energy and minerals in the day-to-day applications since time immemorable. He also briefed the history of the mineral processing in the country.
- ❖ Dr D. Ramaiah, Director, CSIR-NEIST, Jorhat and Chairman, Organizing Committee, NECMICO-14 mentioned about the un-utilized resource potentials of NE Region and urged all the State Govt., Central Govt., Industries and R & D Organizations to work together under flagship programme towards contributing the solution of the problem in the region.
- ❖ Dr. P. G. Rao, VC, USTM and former Director, CSIR-NEIST in his lecture/speech opined about the lack of uniform policy or guidelines for mining of Coal in the NE Region. NER Coals & Minerals, Issues, Challenges and Opportunities, the subject that will never end and will bother the region and the research process. The challenges can not be changed overnight. A continuous thinking, processing and finding solutions is required to overcome these challenges. This resource of coal has an unique opportunities and characteristics, which may not have been exploited the way it has been done in other part of the country. Value addition to graphite has also not been given due importance. The technological challenges due to high sulphur contents, different guidelines for mining of coals in NE region are the gaps, which need to be addressed. All these issues should be raised in the regional, national, and international levels for generating sources to be used in the future, remarked Dr Rao. He further stressed to focus on the coal conversion processes, such as liquefaction, development of cheaper catalysts so that the coal to oil conversion becomes competitive in future as the future lies on coal, particularly for NE region.
- ❖ The Foundation Day lecture was given by Dr. S.K. Biswal, Vice-President, IIME and Chief Scientist of CSIR-IMMT, Bhubaneswar on **technological challenges on Low Grade Iron Ore Beneficiation and Pelletization** and announced the new committee formed for IIME-NE Chapter after the digital inauguration of the same by Prof. T. C. Rao, president of the session.
- ❖ Dr. P Sengupta, Vice-President of the Organizing committee, NECMICO-2014 and Chief Scientist, CSIR-NEIST, Jorhat briefed the background of the Symposium-cum-Workshop.
- ❖ NECMICO-14 souvenir was released by Dr. Amalendu Sinha, Guest of Honour and Director, CSIR-CIMFR, Dhanbad in presence of Prof. T.C. Rao, Dr. P.G.Rao, Dr. D. Ramaiah, Mr. A.K. Bharali, Dr. S.K. Biswal, Dr. R.C. Boruah and Dr. B.P. Baruah. Thereafter, Dr. Amalendu Sinha through his speech informed that CSIR-CIMFR had been catering to the needs of Coal based Industries since inception with the solutions such as Clean Coal Technology, Coal quality analysis, Coal carbonization, Coal gasification, Combustion, environmental management etc. He briefed about the availability of deposits of fossil fuel, uranium,

limestone and other minerals in the NE region and there is a need for further exploration and exploitation. He also stressed on addressing the challenges and grab opportunities for sustainable development with immense growth by venturing into the resources of the region. He also added for organizing more of such workshops and seminars so that the student community is benefited and gain knowledge about the resources found in this part of the region.

- ❖ Mr A.K. Bharali, GM, Coal India Limited, Margherita stressed the need of R&D for conversion of overburden materials in the NE coal mines as a resource to value added products. He also mentioned about the issues such as steep inclination of coal seams, environmental clearance in opencast mining and water pollution in mining areas of Meghalaya in particular which encounters difficulties in mining resulting in low production of coal in the state.
- ❖ Dr R.C. Boruah, Outstanding Scientist, CSIR-NEIST, Jorhat briefed about the common problems and the future prospects of beneficiation of Coal and minerals in the NE region. He stressed on the sustainable technologies for the development of the region.
- ❖ Prof. T.C. Rao has delivered presidential speech on “**Challenges for Mineral Industry in North East India**”. In his presidential remarks, he stressed the urgent need for a centrally located technology cell at CSIR-NEIST, Jorhat to undertake mineral industry development activity as a central platform, co-ordinating with all stakeholders of the region. He also added that there is an urgent need for paradigm shift in the thought process for suitable solutions to the problems of the mineral industry. CSIR-NEIST should get wider canvas to paint “MINERALISA”. He stressed on a strategic alliance of Mineral and IT industries with CSIR-NEIST for bringing a revolutionary step towards sustainable future during his presentation.

## Technical sessions

### ***Technical Session I; Venue: Dr. JN Baruah Auditorium, CSIR-NEIST; Time: 2:00 PM-3:00 PM***

**Theme: Coal & Mineral characterization and beneficiation**

**Chairman: Dr. Amalendu Sinha**

**Co-Chairman: Dr. S. K. Biswal**

- |                  |  |                                       |
|------------------|--|---------------------------------------|
| <b>Lecture 1</b> | Utilization of Low Sulphur North Eastern Coals for Metallurgical purposes After Suitable Blending with Beneficiated LVC Coals Of Jharia Coalfields | <b>Dr. T Gouricharan</b>              |
| <b>Lecture 2</b> | Recovery of fine particle by using ionic microbubble flotation   | <b>Rajeev Parmer/Dr. S K Majumder</b> |
| <b>Lecture 3</b> | Amenability of a Banded Iron Ore from Karnataka to Beneficiation   | <b>Prof. S J G Krishna</b>            |

### ***Technical Session II; Time: 3:30 PM-4:50 PM***

**Theme: Advanced Coal and Mineral characterization techniques**

**Chairman: Dr. Amalendu Sinha**

**Co-Chairman: Mr A.K. Bharali**

- |                  |   |                           |
|------------------|---|---------------------------|
| <b>Lecture 1</b> | Influence of petrography and microchemistry in upgradation of low and sub-grade ores: Some case studies | <b>Dr. B K Mohapatra</b>  |
| <b>Lecture 2</b> | Optimization of coal blends for Indian Steel Industry   | <b>Dr. Ashok K. Singh</b> |
| <b>Lecture 3</b> | Prospect of Utilization of Natural Graphite Resources in India  | <b>Dr. S K Biswal</b>     |
| <b>Lecture 4</b> | Preparation of Al <sub>2</sub> O <sub>3</sub> -SiC-C composite powder from coal mine wastes             | <b>Dr. S K Singh</b>      |

**Day-2 (31.10.2014)**

### ***Technical Session III; Venue: Iyengar Hall, CSIR-NEIST; Time: 9:00 AM-10:20 PM***

**Theme: Coal and Mineral Utilization Technologies**

**Chairman: Dr. P G Rao**

**Co-Chairman: Dr. Ashok K. Singh**

- |                  |   |                        |
|------------------|---|------------------------|
| <b>Lecture 1</b> | Scope and Future Prospect of Utilization of Few Identified Minerals in NE India | <b>Dr. P Sengupta</b>  |
| <b>Lecture 2</b> | North Eastern coalfields (CIL): A story of hopes, aspiration & dreams           | <b>Mr. A K Bharali</b> |
| <b>Lecture 3</b> | Montmorillonite: A versatile clay mineral for diverse application               | <b>Dr. D K Dutta</b>   |
| <b>Lecture 4</b> | Dry beneficiation of a Low-Grade Limestone from Lokapur, for cement Industries  | <b>Dr. C Rudrappa</b>  |

### ***Technical Session IV; Time: 11:00 PM-11:40 PM***

**Theme: Environmental issues in coal and mineral exploration & utilization**

**Chairman: Dr. P G Rao**

**Co-Chairman: Prof. S J G Krishna**

- |                  |  |                       |
|------------------|--|-----------------------|
| <b>Lecture 1</b> | Optimization for Utilizing Fly Ash from Captive Coal Based Thermal Plant | <b>P.Sarath Kumar</b> |
| <b>Lecture 2</b> | Exploiting NER coal resources and environmental implications             | <b>Dr. B P Baruah</b> |

### ***Technical Session V; Venue: Iyengar Hall, CSIR-NEIST Time: 11:40 PM-1:00 PM;***

**Theme: Panel discussions & Recommendations**

**Chairman: Dr. P G Rao**

**Co-Chairman: Dr. Amalendu Sinha**

**Panel of Experts:**

1. Dr. T C Rao, Former Director, RRL-Bhopal
2. Dr. P G Rao, Vice-Chancellor, USTM-Meghalaya and former Director, CSIR-NEIST, Jorhat
3. Dr. D Ramaiah, Director, CSIR-NEIST
4. Dr. A Sinha, Director, CSIR-CIMFR, Dhanbad
5. Dr. S K Biswal, Chief Scientist, CSIR-IMMT, Bhubaneswar
6. Prof. S J Gopalakrishnan, VSKU, Karnataka
7. Dr. T Gouricharan, Sr. Pr. Scientist, CSIR-CIMFR, Dhanbad
8. Mr. A K Bharali, GM, CIL, Margherita
9. Dr. Ashok Kr. Singh, CSIR-CIMFR, Dhanbad
10. Dr. R C Boruah, Outstanding Scientist, CSIR-NEIST
11. Dr. B P Baruah, CSIR-NEIST; 12. Dr. P Sengupta, Chief Scientist, CSIR-NEIST

## **A. Outcome of the technical sessions**

- ❖ Blending of NER coals with low sulphur Indian coals is a good proposition for using in power and production of coke making industries.
- ❖ Washing of NER coals like other high ash coals to reduce ash and sulphur.
- ❖ For optimization of blend ratio, sulphur ratio and ash ratio, a detailed R&D study is required which can be taken up jointly with CSIR-CIMFR. Blending of coals with low sulphur coals for beneficiation to be used in steel/power industries.
- ❖ For recovery of fine particles by micro-bubble floatation, it was suggested to try for the minerals which have inherently less than 100 micron size available in the region.
- ❖ Banded iron ore from Karnataka can be improved by beneficiation to the extent of 63% or more of Fe content meeting the industry specifications.
- ❖ Petrography and microchemistry in mineral processing industry is an important area which is needed to be promoted particularly for NE region as emphasized by Dr.TC Rao and Dr. PG Rao.
- ❖ The demand and beneficiation of natural graphite, preparation of colloidal graphite, characterization of graphitic oxide and reduced graphitic oxide are the prospects for utilization of the graphite resource in NE region. The top surface sample of graphite is to be characterized along with the exploration of the untouched graphite reserves for studying the crystalline nature required for recovering the graphitic value
- ❖ The efficient utilization of coal mine waste can be done through preparation of  $Al_2O_3$ -SiC-C composite by plasma technique, to which a joint R&D project with CSIR-IMMT, Bhubneswar and CIL may be initiated..
- ❖ Mining in NE region by opencast or underground methods is encountered with technical complexities. By overcoming these, production has to be increased to maintain the demand and supply chain. CIL is working towards sustainable mining.
- ❖ Chemicals from coal has been emphasized through the gasification route particularly production of methanol as feedstock. Also catalysts like iridium based etc. can be used for production of chemicals such as acetic acid from methanol. Methanol is also used in the industries situated in the region.
- ❖ Dry beneficiation from Low-Grade Limestone from Lokapur yielded 70% of lime content which can be used in cement industry. Lime supplement material in coal utilization is a good technology for industrial use.
- ❖ Beneficiation of fly ash for recovering value added product like cenosphere may be attempted.
- ❖ NER coal resources and associated environmental issues from mining to utilization for degradation of soil, water, sediment and air quality and emission characteristics, factor comparison with standards have been discussed. Suitable processes for remediation of site specific AMD control, low C- and S- emission coke making, and use of high sulphur coals in the power generation have been developed in the institute. The Chairman stressed on the management of AMD in NER coal mines as some unauthorized mining has been banned in the state of Meghalaya. Coal India Limited will also take care of this AMD problem in their mines. The Chairman further stressed on scientific work to be done and come out with practicing AMD management technologies in the mining areas.

All the technical sessions concluded by giving vote of thanks from the organizing committee.

## **B. Panel discussion**

### **Dr. S K Biswal**

- Double precipitated lime can be prepared and industrially utilized.
- Value addition to limestone of Meghalaya.
- Reduction of impurities in limestone by high concentration alkali leaching.

- The scrubbing technique using lime water to remove SO<sub>2</sub> gas from flue gas of power plant.
- Placer gold recovery through enhanced gravity separation technique from Subansiri river, NE India.
- Trace elements of iron phase minerals can be made more suitable as refractory grade by high intensity magnetic separator.
- Exploration of Graphite (Arunachal Pradesh) and clay minerals.

#### **Dr. Ashok Kr. Singh**

- Upgradation and updation of the mineral inventory of North East India is required.
- Proper environment friendly and safe mining system to be adopted in case of coal and other minerals.
- Attention to be given towards exploration of Graphite of Arunachal Pradesh.
- Improve the quality of coal through blending process for use by NTPC and CIL to save foreign exchange.
- Basic research to be taken up in a systematic way among the R&D institute, industry and academic institute in the field of mineral mapping, exploration and applied research and a core group can be formed for undertaking such studies.

#### **Mr. A K Bharali**

- For prevention of aqueous leachate water from coal dumps percolation to the ground, actions can be initiated by constructing RCC slab in the coal dumping area.
- As the pot holes in the coal mines of Meghalaya are often catching fire, action to be taken to save the people and the mines of Meghalaya.

#### **Dr. R C Boruah**

- Innovation of new technologies to save environment from different types of mining.
- Look for exploration of Graphite from Arunachal Pradesh.
- To explore the possibilities of minerals on the bank and river bed of the Brahmaputra river.
- Value addition to limestone of Meghalaya, so that it can be used by various industries.
- Emphasized on pure drinking water in the region.

#### **Dr. D Ramaiah**

- By starting the IIME-NE chapter, it must be clear in mind what we want to do, where our strength lies and what are the challenges ahead and the new chapter to be the bridge between all stakeholders.
- Clear cut road map very essential in mineral sector in NE India and one should be more active with the government.
- Proposed for establishment of '*Innovation Centre*' for Northeastern region, India related to coal, petroleum and other economic minerals.
- Creation of public awareness for the need of industrialization of NER, India by using available resources.
- CSIR-NEIST can be a bridge among the stakeholders, policy makers and government and can play a greater role to NER India not only for the society but also for the optimal utilization of the resources.

#### **Dr. A Sinha**

- For cleaner use, low ash coal can also be blended with high ash coal.
- Coal mining industries need to follow the rules and regulations imposed by the government, the processes and technologies should be adopted for reclamation of mine water.
- Proposed for holding workshop/symposium/meet of IIME-NE chapter annually, even by rotating the venue, so that there would be better visibility, and activities of the chapter would be meaningful.

#### **Dr. T C Rao**

- Minerals are in abundance in NE India, the region is still virgin, so minerals are to be mined with the expertise available.

- Mineral maps of NE India to be prepared.
- Proper mining technology to be adopted maintaining the environment safe and green.
- Ideal place for CSIR-NEIST, Jorhat and other CSIR-institutes for collaboration by development of mineral processing area and CSIR-NEIST could act as a ventilation.
- Mines to metal, value of downstream products, rehabilitation/restoration of quality of environment and cost, integration of IT & Communication, use of robotics for mining mineral are some of the areas to be taken care of.
- A **Centrally located Technology cell** at CSIR-NEIST to act as a Central platform can be established for co-ordinating with all stake holders. **NEIST should get wider canvas to paint “MINERALISA”**
- Mineral Industry needs synergies of technical, economical and environmental issues for best performance.
- Industries and Govt. agencies should foster the research support.
- Long term planning and vision is essential for mineral industry to survive and sustain.
- Proposed the formation of a Core Group with four persons to look for where mining is starting, what kind of mining is adopted, mineral processing and other activities of minerals of the region.

#### **Proposed Core Group**

(i) Dr. D Ramaiah, (ii) Dr. P G Rao, (iii) Dr. P Sengupta, and (iv) Dr. B P Baruah

#### **Dr. PG Rao**

- Emphasized on rich biodiversity and natural resources of NE India and appeals to all to be positive in their approach towards the challenges and opportunities ahead in the mineral sector of the region.

#### **C. Interactive session with the students**

The student delegates/ participants from various educational institutes and young scientists participated in the interactive sessions. Their queries were on gasification, underground coal gasification, coal bed methane, coal mine methane, greenhouse gas potentials, application of IT, remote sensing and GIS.

The reply to the queries are given as under:

- ❖ Coal gasification is an alternative source of fuel. Coal is generally subjected to surface gasification in a gasifier to get cleaner energy. For cleaner use low ash coal can also be mixed with high ash coal.
- ❖ Aerial survey should be supplemented with geophysical and geological survey for complete identification and mapping of mineral rich zones.
- ❖ Production of methane is around 10 m<sup>3</sup> per tonnes of coal in Makum coalfield which needs to be diluted by external air injection into the mines and should have proper ventilation to avoid methane explosion. Methane is 20 times more potent than carbon dioxide in terms of GHG potentials.
- ❖ Underground coal gasification is suitable process for generation of energy and production of chemicals.

The student participants/ delegates were taken round the laboratory for exchange of ideas, to have a first hand information on the expertise and facilities available in the institute.

#### **D. Final Recommendations/Working Agenda**

The final agenda items recommended for action are

1. Formulation of an uniform policy or guidelines for mining of coal and minerals in the NE Region where long-term planning and vision is crucial for mineral industry to survive and sustain in this competitive world.
2. Upgradation and updation of inventories for coal and mineral deposits for NE India.
3. Mapping, characterization, beneficiation and sustainable process development for the unexplored coal and mineral resources are to be done.
4. Exploration and beneficiation of graphite and clay minerals of the region is required.
5. Management of Acid Mine Drainage (AMD) at source may be followed for mining of coal in NE region.
6. Blending of NER coals with other Indian coals for utilization by NTPC and SAIL. R&D project should be initiated jointly with CSIR-CIMFR and some industrial partners for optimization of blends for industrial uses.
7. Recovery of minerals and placer gold from the river system.
8. Value added products from coal mine rejects may be taken up in project mode with CSIR-IMMT, CSIR-NEIST and Coal India Limited.
9. Formation of a **core group consisting of Dr. D Ramaiah, Dr. PG Rao , Dr. P Sengupta and Dr. BP Baruah** for taking a close look at the mining methods adopted, mineral processing and other activities of minerals of the region. CSIR-NEIST can act as a bridge between the stakeholders and Govt. policy makers and can play a greater role for NER India not only for the society but also for the optimal utilization of the resources.
10. Establishment of Innovation Centre, public awareness and academia-industry-R&D interaction for pacing up the research in the mineral sector of the region and CSIR-NEIST, Jorhat should work as a ventilation.
11. Stressing on Cleaner Coal technologies for sustainable environment.
12. Need to have a centrally located Technology Cell at CSIR-NEIST to undertake the Mineral Industry Development Activity to act as a central platform, coordinating with all stakeholders. There is an urgent need for paradigm shift in the thought process about the prospective solutions for the mineral industry by including R&D in mineral processing.

**The session on Panel discussions and recommendations were concluded after vote of thanks from the Chair and organizing committee.**



## **Annexure I**

---

### **Executive Council of IIME-North East Chapter (IIME-NEC) CSIR-NEIST, Jorhat (Assam)**

---

**President**

Dr. P. Sengupta

**Vice-Presidents**

Dr. P. Kotoky  
Dr. M. K. Baruah

**Secretary**

Dr. B. P. Baruah

**Joint Secretaries**

Dr. Binoy K. Saikia  
Dr. Manash R. Das

**Executive Members**

Dr. Prasenjit Saikia  
Dr. H. P. Dekaboruah  
Dr. R. L. Goswamee  
Dr. Dipankar Neog  
Dr. Jayanta J. Bora  
Dr. (Mrs.) Swapnali Hazarika  
Dr. B. J. Bora  
Dr. Puja Khare  
Dr. S. K. Majumder  
Mr. D. R. Kanungo  
Mr. Tonkeswar Das  
Mr. Paran J. Kalita

---

**Treasurer:** Dr. Lakhi Saikia

---

**Patrons: Dr PG Rao, VC, USTM, Meghalaya, Dr D Ramaiah, Director, CSIR-NEIST,  
Jorhat, Mr AK Bharali, GM, NECL, Margherita**

---

**Student Members**

---

Ms. Arpita Sharma  
Ms Gitashree Darabdhara  
Ms Runjun Chetia  
Ms Jyotilima Saikia  
Ms Arju Moni Dutta  
Ms Ananya Saikia  
Ms Banashree Mahanta

Mr Diganta Bhuyan  
Mr Najrul Hussain  
Mrs. Ponchami Sharma  
Mr Rahul Choudhury  
Mr Prabin Das  
Mr Mrinal Saikia  
Ms Mridusmita Sarmah  
Ms Linee Goswamee

---