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CONTENTS

PRESIDENT'S COLUMN

Our Society has been highlighting the importance and urgency of reassessment of resources i.e. iron & manganese ores and chromite in particular, when the existing limited resources of these industrial minerals started getting depleted at a faster rate in the recent years. With this objective, the Seminar on **Iron Ores – Genesis and Exploration Techniques** was organized by SGAT in December 2008. Experts deliberating in the Seminar opined that there are possibilities of discovering new iron ore bodies and suggested for future explorations to be concept oriented based on tested genesis modules. It should also aim to locate concealed ore bodies like channel deposits and to adopt state of art technologies for faster and deeper drillings. Further, it was advised for reassessment of all leaseholds and freeholds, besides dumps and slimes. Simultaneously, the need for assessment of BHQ and BHJ resources with R&D efforts for beneficiation to upgrade these low grade resources which can prove to be economically viable, was highlighted. The proceedings of the Seminar with recommendations have been forwarded to both State and Central Governments and concerned departments. We hope that actions are initiated early to establish additional resources for future.

In the meantime, SGAT has completed its assignment of preparation of "Vision Mineral Development – 2020 for Orissa" and it has been submitted to Department of Steel & Mines of the State Govt. The salient features of this document is printed in this volume for the benefit of readers.

Following successful Workshop on "Requirement of Water for Mining and Mineral Based Industries", SGAT is organizing a one day Workshop on "Requirement of Power for Mining and Mineral Based Industries" on 1st August 2009 inviting Planners, Regulators, Generators, Transmission and Distribution Agencies and senior executives of Mining and Mineral Based Industries for in depth discussion. Hopefully the Workshop would guide the industries to take right steps and Govt. for necessary measures in the interest of sustenance of existing trend of development of mineral sector.

In order to continue wi th our efforts towards mineral development, a Seminar on "Global Recession and its impact on Mining and Mineral Based Industries" is proposed to be organized in December 2009. Experts from the fields of international marketing, global economy and eminent persons from industries are being invited for keynote address and guest lectures.

Dr. R.C. Mohanty
(President, SGAT)

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MICROBIAL REMOVAL OF ALUMINA AND SILICA FROM LOW GRADE IRON ORES

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ABSTRACT

Bio- beneficiation technique is gaining importance these days as conventional beneficiation techniques are very expensive, energy inefficient and have adverse effect on environment. High alumina and silica content in iron ore affects specific coke rate, reducibility and productivity in blast furnace operation. Therefore studies were undertaken to develop a microbial process to solubilize alumina and silica from low grade iron ore. In this study several heterotrophic microbial strains were used for removal of alumina and silica from Salem iron ore (India) which contains (%) Fe_2O_3 – 84.4, Fe (Total)- 59.02, Al_2O_3-7.18, SiO_2 -7.53. Bacillus circulans could remove 15.95% alumina and 18.58 % silica at 20% pulp density, 35^{0}C and 150rpm in 10 days . Among the fungal strains Aspergillus fumigatus was found to be most effective. It solubilized 20.63% and 21.23% of alumina and silica respectively at the same culture conditions. The above technique of Iron ore beneficiation will help not only to conserve equal amount of good grade iron ore but also reduces environmental pollution.

Key words: - Bio- Beneficiation; low grade iron ore; high alumina; high silica

1. INTRODUCTION

India is blessed with large reserves of iron ore containing mostly 50-60% Fe. Most of these ores are not suitable for blast furnace operation due to the presence of high level of impurities like alumina and silica. High alumina and silica present in iron ore affect coke consumption rate, reducibility, productivity in blast furnace operation. Iron ores with Fe content 63% - 65% or more than that are desirable for blast furnace operation or direct reduction. Due to the non availability of high quality iron ore, low grade iron ore with high alumina and silica are needed to be beneficiated for effective utilization. Iron ore is being beneficiated all round the world to meet the quality requirement of Iron and Steel making. However, each source of Iron ore has its own peculiar mineralogical characteristics and requires the specific beneficiation techniques and metallurgical treatment to get the best product out of it. The choice of the beneficiation process treatment depends on the nature of the gangue present and its association with the ore structure [1]. The advanced physico-chemical methods used for the beneficiation of iron ore are generally not environment friendly and cost effective.

The use of microorganisms in beneficiation of lean grade ores and minerals is widely considered as an efficient, economical and environmental benign alternative to conventional methods [2]. Biobenificiation is a distinct concept from bioleaching and by definition refers to selective removal of undesirable gangue mineral constituents from the low grade ore through interaction with microorganisms, thus enriching it with respect to the desired and valuable minerals. Biobeneficiation is gaining importance due to depletion of high grade ores and strict

anti-pollution laws [3]. Both chemolith-otrophic and heterotrophic microorganisms play important role in the solubilization of metal ions from ores [4-8]. Heterotrophic bacteria and fungi are known to produce organic acids which can dissolve metals by forming salts or complexes like chelates [9]. These chelates are soluble or insoluble depending upon the structure of the ligand and insolubility of the complexes in relation to the Eh and pH of the system [10]. Microbes, basically fungus are well known for their ability to produce organic acids (oxalic, isocitric, succinic, malic, citric etc) and among them Aspergillus sp. has been most intensively studied [11-13].

Usually siliceous bearing oxides contain larger amount of alumina in form of clay and present in association with laterite. Many microorganisms have been reported to solubilise different alumino-silicate compounds found in nature. In silicates silicon is surrounded by four oxygen atoms in tetrahedral fashion [14] whereas aluminium in alumino-silicates is coordinated with in tetrahedral or octahedral fashion, depending upon the mineral [15] In minerals, these units are arranged in bi or tri layers separated by water layers of variable thickness into which other polar molecules including organic molecules can enter. This type of structure makes them susceptible for weathering by microorganisms [3]. Si-O bonds of siloxane linkages (Si-O-Si) in silicates and alumino silicates are very strong, whereas Al-O bonds are somewhat weaker. Thus Si-O bonds are relatively resistant to acid hydrolysis [16], unlike Al-O bonds. Some bacteria can solubilise silica and silicates by forming chelators, acid or bases and exopolysaccharides which can react with silica and silicates.

Although the use of different microorganisms in ore leaching is well established, use of microorganisms in reducing alumina and silica from ores has been attempted in few investigations [17]. This paper describes beneficiation of high alumina and silica containing low grade iron ore with *Aspergillus fumigatus, Aspergillus niger Aspergillus flavus, Bacillus circulans, Bacillus polymyxa, Pseudomonas putida* and *Pseudomonas aeuruginosa*

2. MATERIALS AND METHODS

2.1. Iron ore sample

Low grade iron ore samples were obtained from Salem area, a reputed mine in Tamilnadu, India. The samples were analyzed by wet chemical and XRF techniques The chemical analysis is shown in Table-1.

Table 1. Chemical analysis of Salem iron ore .

Constituents	Percentage
Fe_2O_3	84.40
Fe(Total)	59.02
Al_2O_3	7.18
SiO_2	7.53
Na_2O	0.06
MgO	0.21
SO_3	0.19
K_2O	0.04
CaO	0.07
MnO	0.18
TiO_2	0.05

2.2. Mineralogical analysis characterization

Mineralogical characterization of the original sample and microbially treated iron ore was done using high resolution synchrotron based X- ray Diffractometer (XRD) to identify major and minor minerals.

2.3. Microorganisms

Aspergillus fumigatus, Aspergillus niger Aspergillus flavus, Bacillus circulans, Bacillus polymyxa, Pseudomonas putida and *Pseudomonas aeuruginosa* were used for the beneficiation study. The fungal strains were maintained on potato dextrose agar medium and bacterial strains were maintained on nutrient agar medium.

Bromfield medium was used for beneficiation studies which contains (g/L) sucrose-20, Yeast extract 1, K_2HPO_4 0.25, NH_4SO_4 0.27, $MgSO_4$ 0.75, Sodium biphosphate 0.30, pH-6.8.

2.4. Shake flask beneficiation studies

Microbial strains used in the shake flask experiment are, *Bacillus circulans, Bacillus polymyxa, Pseudomonas putida, Pseudomonas aeuruginosa A. fumigatus, A. niger and, A .flavus.* Experiments were carried out with 90 ml of Bromfield medium and 10% (v/v) inoculum in 250ml Erlenmeyer flask under sterile conditions. Each flask was inoculated with approximately 10^8 cfu/ml of each bacterium or 10^6 spores/ml of each fungus. The experiments were conducted at 20% pulp density, 35^0C and 150 rpm for 10 days. Solid samples were taken out at regular intervals of time to study the gradual decrease in the alumina and silica concentration in the ore. pH and the carbohydrate concentration of the solution were monitored regularly. At the end of each the experiment, solid residue was separated by filtration, dried in hot air oven and analyzed for Al, Si and Fe by XRF. The XRF analyses were carried out against standard calibrated samples of similar nature.

3. RESULTS AND DISCUSSION

3.1. Mineralogical analysis

X ray diffraction pattern of the iron ore sample show that the major minerals present in the sample are hematite, magnetite, quartz and goethite (Figure.1). Goethite is a very important Iron bearing mineral in these samples. It is of two types i.e. vitreous and ochreous. Vitreous goethite is hard and compact whereas ochreous is fine grained and friable. Kaolinite and gibbsite constitute the major volume of aluminous gangue minerals in hematite bearing iron ore sample. These minerals are fine grained and intimately associated with ochreous goethite. The Kaolinite peaks disappear at some places in the XRD results of the microbially treated samples. This shows that the organic acids produced by the microbes selectively attack the alumino silicate bonds of Kaolinite and help in releasing alumina and silica to the solution. The XRD studies also support the removal of quartz from the iron ore.

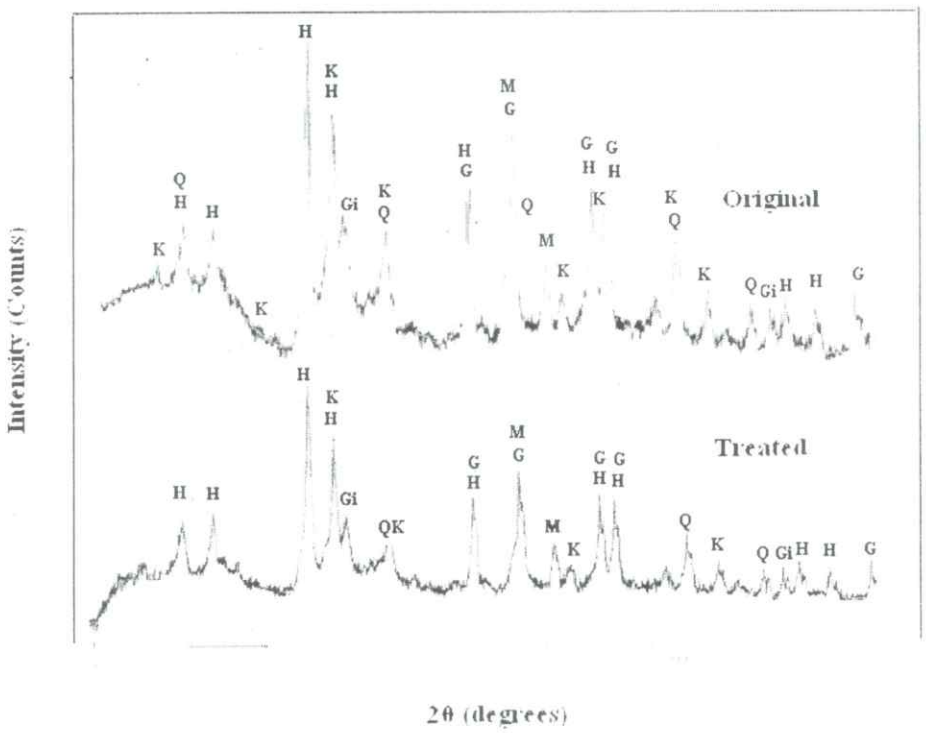

Fig 1. : XRD pattern of original and microbially treated iron ore
H: Hematite, M: Magnetite, Gi: Gibbsite, Go: Goethite, K: Kaolinite, Q: Quartz

3.2. Microbial Beneficiation study

Aspergillus sp. and *Bacillus* sp. are found to be involved in the leaching and beneficiation processes of silicate ores and minerals [18-19]. The Si-O Si or Al-O frame work might be cleaved due to microbial action leading to the solubilization or the removal of cations from the crystal lattice of silicate causing the subsequent collapse of silicate lattice structure.

It can be observed from Figure 2, that *Bacillus circulans* showed the highest removal of alumina and silica i.e. 15.95% & 18.58% respectively at 150rpm rotation, 20% pulp density and 35^{0}C, whereas *P. aeuruginosa, B. polymyxa* and *P. putida* showed 14.71%, 10.86%, 4.45% alumina removal and 11.5%, 14.53%, 3.03 % silica removal respectively.

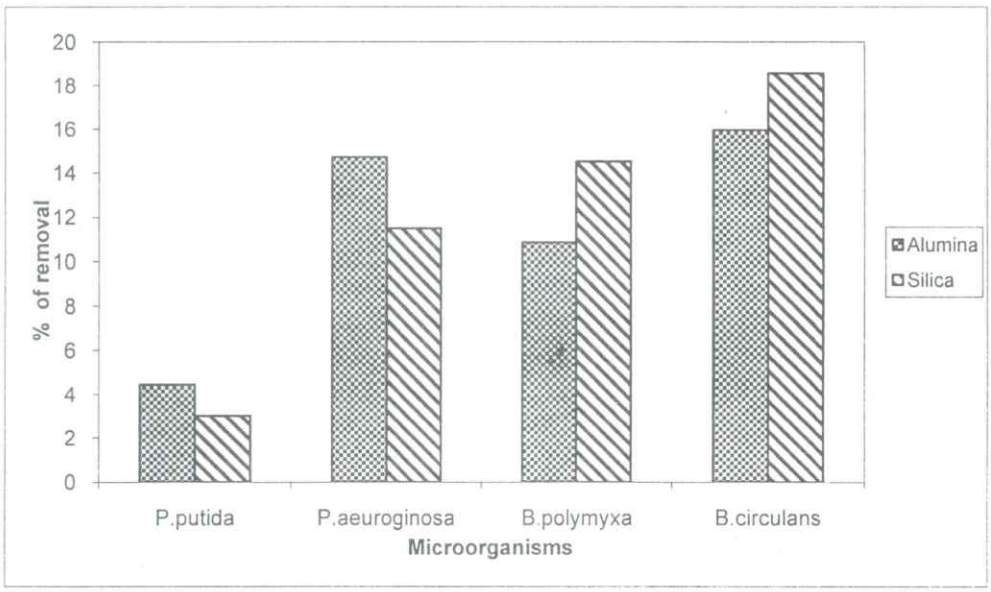

Fig. 2. Percentage of alumina and silica removal from Salem iron ore using different bacterial strains (Conditions- 20% pulp density, 35^{0}C, 150rpm, 10 Days)

It is clearly indicated by Figure 3 that among the fungal strains, *Asperigillus fumigatus* dominated the beneficiation process by removing 20.63% alumina and 21.23% silica. *Asperigillus niger* and *Asperigillus flavus* removed 16.9%, 15.4% of alumina and 17.82%, 21.23% silica respectively at similar experimental conditions.

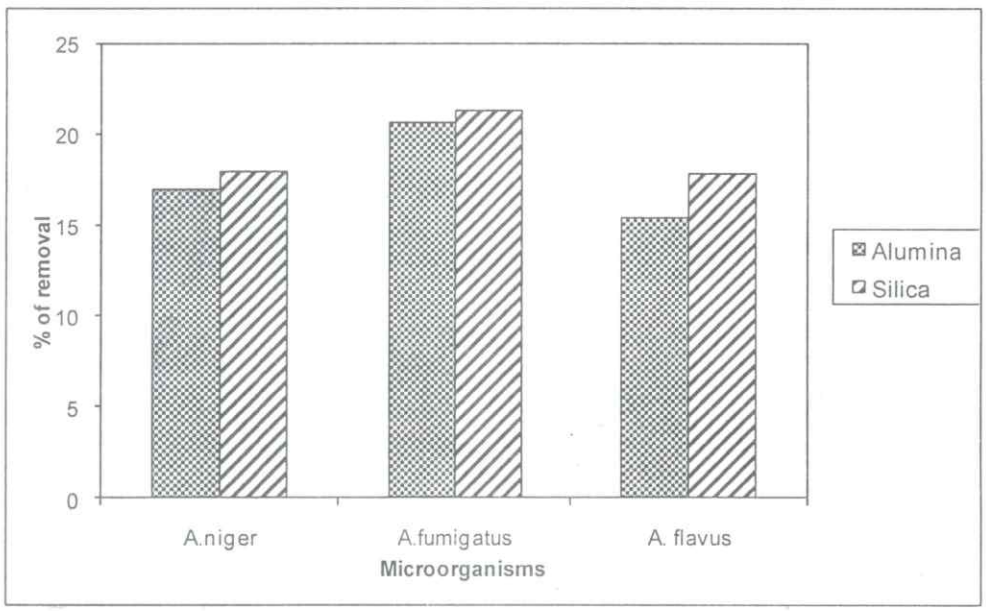

Fig. 3. Percentage of alumina and silica removal from Salem iron ore using different fungal strains (Conditions- 20% pulp density, 35^{0}C, 150rpm, 10 Days)

3.3. Carbohydrate utilization

Figure 4 shows the carbohydrate utilization by the organisms .The organisms utilized the sugar to produce organic acids and other metabolites. The fastest utilization of sugar was observed in case of *A.fumigatus*. It completely utilized the sugar in 8 days. *A. niger* took 10 days to utilize the sugar completely. *Bacillus circulans* consumed the sugar faster in comparison to the other bacterial strains. Rest of the organisms could not utilize the sugar in the given time period.

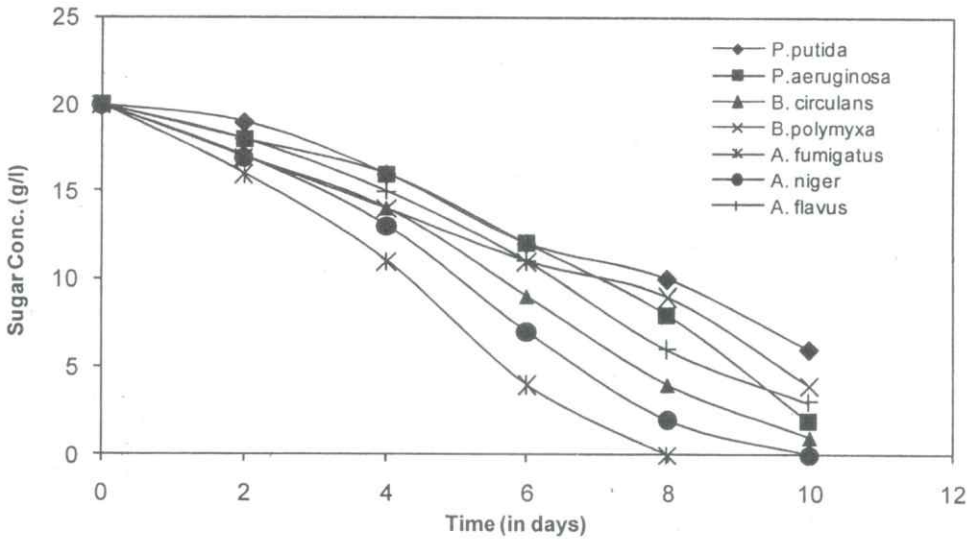

Fig. 4: Variation in sugar concentration with respect to time during microbial beneficiation experiment using different microbial strains. (Conditions:- 20% pulp density, 35^{0}C, 150rpm, 10 Days)

Fig.5 shows the decrease in pH of the medium during the growth of the organisms. This decrease was due to the production of organic acids via incomplete oxidation of carbohydrate source such as

$$C_6H_{12}O_6 + 4.5O_2 \longrightarrow 3C_2H_2O_4+3H_2O$$

Citric acid

$$C_6H_{12}O_6+1.5O_2 \longrightarrow C_6H_6O_7+2H_2$$

Oxalic acid

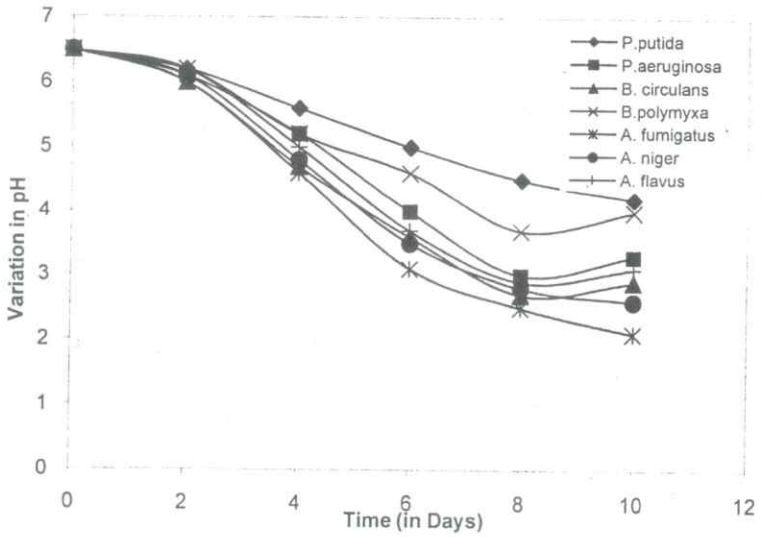

Fig. 5. Variation in pH of the medium during the microbial beneficiation experiments with different microbial strains.(Conditions:- 20% pulp density, 35^{0}C, 150rpm, 10 Days)

The accumulation of organic acids by the microbes resulted in drop of pH. Incase of bacterial strains the lowest pH was observed in case of *Bacillus circulans*. The pH decreased to 2.9 from the initial pH of 6.8.The pH drop was faster in *A. fumigatus* in comparison to other strains. The final pH of the medium was 2.1 in case of the above fungus which was lowest among the fungal strains. The decrease in pH was more in case of fungal strains than bacterial strains.

3.4. Possible mechanism

During metabolism, microorganisms convert glucose or other carbohydrates into variety of products, including organic acids and proteins. Bio-leaching processes are mediated due to the chemical attack by the extracted organic acids on the ores. Acids usually have dual effect of increasing metal dissolution by lowering the pH and increasing the load of soluble metals by complexing/chelating into soluble organo-metallic complexes [20]. Citric acid is a tricarboxylic acid and contains three carboxylic groups and one hydroxyl group as possible donor of protons (H^+) [21]. When aluminium cations Al^{+3} are present in system and citric acid is fully dissociated in aqueous solution, a complexation reaction may take place [22]:

$$C_6H_8O_7 \longleftrightarrow (C_6H_8O_7)^{3-} + 3H^+ \ (pKa_3=6.39)$$

$$(C_6H_8O_7)^{3-} + Al^{3+} \longleftrightarrow Al(C_6H_5O_7) \text{ Aluminium citrate complex}$$

Similarly oxalic acid contains two carboxyl groups so the possible complexes of aluminium cation with oxalate anion are

$C_2H_2O_4 \longleftrightarrow (C_2HO_4)^{1-} + H^+ (pKa_1 = 1.20)$

$3(C_2HO_4)^{1-} + Al^{3+} \longleftrightarrow Al(C_2HO_4)_3$ Aluminium oxalate complex or

$C_2H_2O_4 \longleftrightarrow (C_2O_4)^{1-} + 2H^+ (pKa_1 = 4.20)$

$3(C_2O_4)^{1-} + 2Al^{3+} \longleftrightarrow Al_2(C_2HO_4)_3$ Aluminium oxalate complex

Microbially produced ligands of divalent cations have been shown to cause dissolution of calcium containing silicates. These ligands include 2-ketogluconic acid [23], gluconic acid [24-26] citric [27], oxalic, humic acid [28] etc. A wide variety of microorganisms have been reported to produce acidic metabolites, which are responsible in solubilisation of alumino-silicates [29]. *Bacillus* sp. is known to produce extra-cellular polysaccharides [30] and other metabolites, which may be playing a role in alumina solubilisation from iron ore slime. Extra-cellular polysaccharides have been reported to be involved in silicon release [19]. Such polysaccharides, of bacterial or fungal origin, are able to react with silioxanes to form organic silioxanes. *Bacillus mucilaginous* [31] was effective in solubilising Si in addition to Li and Al by reaction of its extra-cellular polysaccharides with the silicate of spodumene. In case of *B. circulans*, drop in pH was less when compared to *A. fumigatus* but solubilization of Al to significant extent even at higher pH indicated the role of extra-cellular polysaccharides. After the beneficiation process the Iron ore can be utilized for iron making and steel and the alumina present in the leach liquor also can be extracted by solvent extraction and precipitation techniques.

4. CONCLUSIONS

Results of the above investigation clearly established that microbes can effectively remove part of alumina and silica from high alumina and silica containing iron ore. The effectiveness of the procedure is greatly influenced by utilization of sugar and production of organic acids. The mineralogical studies supported the above findings that the Kaolinite structure is getting disrupted due to the attack of organic acid. Quartz is also affected by the same organic acids. It can be observed from the results of the shake flask beneficiation studies that among the bacterial strains, *Bacillus circulans* showed the maximum removal of alumina and silica content i.e. 15.95% and 18.58 % respectively. *Asperigillus fumigatus* was found to be most efficient fungal strain. It could remove 20.63% and 21.23% of alumina and silica respectively in 10 days t ime at 20% pulp density, 35^0C and 150rpm. This investigation reveals that the high alumina and silica containing iron ore is no more a waste. It can be beneficiated and can be utilized effectively for iron and steel making.

5. ACKNOWLEDGEMENT

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Preparation of nano-SiC from waste

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Abstract

Thermal plasma with very high temperature (10^4 K), steep temperature gradient (10^6 K m^{-1}) and high quench rate (10^6 K s^{-1}) within the plasma environment provides an attractive route for nano materials synthesis. This paper deals with the preparation of nano-SiC from rice husk, considered as an agricultural waste material. The plasma-synthesised powder has been found to be a good catalyst support material as the catalyst (1% Pt doped) prepared with this powder showed 100% conversion of CO to CO_2 at a temperature as low as 175 °C.

Key words: *Nano-SiC, thermal plasma, rice husk*

INTRODUCTION

In recent years, the increase in interest for preparation of nano materials is sparked by the realization that when the particle size is reduced to the nanometer scale, the majority of the atoms will be located on the surface of the particles. In such a state, the intrinsic properties of the material will change. Enhanced chemical, mechanical, optical and magnetic properties are exhibited by nano powders, opening up a new range of potential uses and applications for these advanced materials. Many processes are being developed currently for preparation of nano materials [Li et al., 2009; Shehata et al., 2009; Kakaç & Pramuanjaroenkij, 2009].

Silicon carbide is one of the most important non-oxide ceramic materials. It has been recognized as an important structural ceramic material because of its unique combination of properties, such as excellent oxidation resistance, strength retention to high temperatures, high wear resistance, high thermal conductivity, and good thermal shock resistance.

The main commercial method of SiC is widely performed by the Acheson process, where high quality sand is reduced by petroleum coke at about 2400 °C. This process of SiC formation requires long reaction time and the particles produced in this process are large agglomerates with a wide range of particle size, which are not suitable for the manufacture of high performance ceramics. Thus, there has been increasing interest in producing ultrafine SiC powders for the manufacture of advanced SiC-based ceramics. Many methods could be used to produce SiC powders, such as carbothermal reduction, sol–gel methods, gas-phase reaction method, self propagation high-temperature synthesis (SHS) and so on [Weimer et al., 1993 ; Raman et al., 2000; Leonhardt e t al., 2005 ; Pampuch et al., 1987]. Among the different techniques used for preparation of ultrafine SiC, thermal plasmas offer an attractive route for synthesis of these powders [Kong & Pfender, 1997; Tong & Reddy, 2006].

The general procedures of thermal plasma synthesis for nano particles are as follows:

1. Plasma formation (Ar, Ar/He, Ar/N_2 plasma)
2. Injection of starting materials (gases, liquids and solids)

3. Reaction steps (heating, melting and evaporating, dissociation, ionization, excitation of s pecies and formation of products)
4. Quenching step (nucleation and particle growth)
5. Particle collection (filters, cyclones, cooled surfaces etc.)

Advantages of plasma processing are summarised below:

1. High temperature (~ 10^4 K) induces fast reaction.
2. Fast quench rate (~ 10^6 K s^{-1}) ensures smaller particle size.
3. Controlled environment (different types of gases such as Ar, H_2, N_2 etc. can be used).
4. Suitable for low cost, high volume production
5. Amenable for operation in a continuous manner with computer process control

RICE HUSK AS A PRECURSOR MATERIAL FOR NANO SiC SYNTHESIS

In general, the plasma processes [Kong & Pfender, 1997] used for synthesis of nano-SiC requires one or more reactive/corrosive gases. To overcome such problems, it is imperative to choose proper reactants. Cost and availability of such precursors are also important factors. In view of such considerations, rice husk, considered as an agricultural waste, was chosen as the precursor material for nano-SiC synthesis. The intimate mixture of SiO_2 and C in the rice husk provides an ideal starting material for SiC synthesis.

A large quantity of rice husk is generated as a by-product of rice milling. At present the rice husk is considered as an agricultural waste. Burning has been the primary means of disposal. Not only does burning create pollution problems but the extremely fine silica ash is also toxic and thus constitutes a health hazard. Even careful incineration procedures can not completely eliminate this airborne silica. Thus, burning with its attendant problems of air pollution and ash disposal has proven to be an unsatisfactory solution.

The advantages of using rice husk as starting material for SiC preparation are as follows;

1. In rice husk, silica and carbon are in intimate contact with requisite proportion, thus no mixing is needed.
2. The intimate contact of silica and carbon in very fine form reduces the reaction time considerably during the pyrolysis process.
3. The silica and carbon in rice husk are in much purer form; hence the purity of the final product is much better compared to the commercial product.
4. Since the starting materials (silica and carbon) in rice husk is in much finer form, the silicon carbide produced in this method is also expected to be in very fine form.

Since the pioneering work of Lee and Cutler (1975), studies have been reported [Rodriguez-Reinoso & Narciso, 1995; Sun & Gong, 2001] on preparation of SiC from rice husk. All these processes are carried out in batch operations and principles of operations are more or less similar. The rice husk is first heated in the temperature range of 400-800 ^oC in an inert atmosphere to remove volatiles. Subsequently, heat treated rice husk is reacted at high temperature > 1300 ^oC in an inert atmosphere for several hours in presence of a catalyst to produce a mixture SiC whiskers and fine powder.

SYNTHESIS OF NANO-SiC IN A RF PLASMA REACTOR

Synthesis of nano-SiC was carried out in a 20 kW RF thermal plasma reactor by inflght processing of charred rice husk. The powdery rice husk (<105 μm) were heat treated at 550 °C for 2 h in nitrogen to remove volatiles in a separate furnace. The heat-treated rice husk was then injected into plasma by means of a powder feeder. The plasma-synthesized powder was loosely deposited at the inner wall of the quartz tube and hence could be scrapped off easily after the experiment. Figure 1 illustrates the flow chart of the process. The details of the experimental procedure are given elsewhere [Singh et al., 1993; Stachowicz et al., 1993]. Some of the results are presented here.

The XRD pattern (Figure. 2a) shows that the charred rice husk is nearly amorphous in nature. The plasma synthesized product is found to be composed of the β-SiC phase as peak position correspond to cubic β-SiC (Figure 2b). The broad XRD peaks could be linked to the formation of nano β-SiC. There is always some possibility that the excess energy of fine powder arising from the lattice strain might cause further broadening of the X-ray profile. This is possible as the high quenching rate in thermal plasma can induce lattice strain. There is a considerable increase in the intensities of XRD peaks (Figure. 2c) of the final product (after oxidation and acid leaching). The heat treatment of the plasma-produced powder during the oxidation to remove excess carbon might have released the lattice strain. The specific surface area of the plasma-synthesised powder is found to be 150 m^2/g. TEM images (Figure 3) reveal that small rounded particles of nano-SiC (10-20 nm) prevail although thin platelets in the shape of equilalteral triangles, truncated triangles, and round shapes are also present.

NANO-SiC FROM RICE HUSK - A NOVEL CATALYST SUPPORT MATERIAL

A majority of commercial catalysts are still supported on alumina, silica or carbon. All these support materials suffer drawbacks. The poor heat conductivity and the chemical reactivity of alumina and silica can induce a decrease in surface area and loss of active sites during operation. The weak oxidation resistance of carbon as support hinders its use for high-temperature oxidative reactions. It is consequently of interest to discover and develop new support materials that can efficiently replace those cited above, mainly in terms of physical properties, avoiding the drawbacks linked to classical industrial supports. Silicon carbide (SiC) exhibits high thermal conductivity, high resistance towards oxidation, high mechanical strength, low specific weight and chemical inertness; all properties required for a good heterogeneous catalyst support material. These attributes could lead to wide use of SiC based catalysts in future.

Platinum (1%) doped silicon carbide was prepared by adopting an impregnation technique. Plasma-synthesized SiC powders were added to chloroplatinic acid solution and the mixture was evaporated to dryness, while stirring on a hot plate with a magnetic stirrer. The resulting chloroplatinic acid soaked silicon carbide was calcined at 600 °C in a muffle furnace [Singh et al., 1995].

Catalytic activity studies for the conversion of CO to CO_2 for doped and undoped SiC samples were carried out in a static bed quartz reactor by taking 100 mg of the sample and passing a gas mixture of CO (5%) and air (95%) at atmospheric pressure. The temperature and flow rate were varied from 100 to 700 °C and from 6 to 10 Lh^{-1}, respectively. The reaction products were

analyzed by on-line gas chromatography using Porapak-Q column.

Platinum loaded SiC samples were found to be very active and showed 100% conversion of CO to CO_2 at a temperature as low as 175 °C. On the contrary, undoped SiC samples were found to be inactive although the powders have high specific surface area (150 m^2 g^{-1}). The activity of the platinum doped samples did not change with variation in flow rate or increase in temperature up to 700 °C. The samples did not deactivate even after 30 h of reaction. The high catalytic performance of the platinum doped samples is perhaps due to the uniform distribution of platinum on the surface of SiC particles.

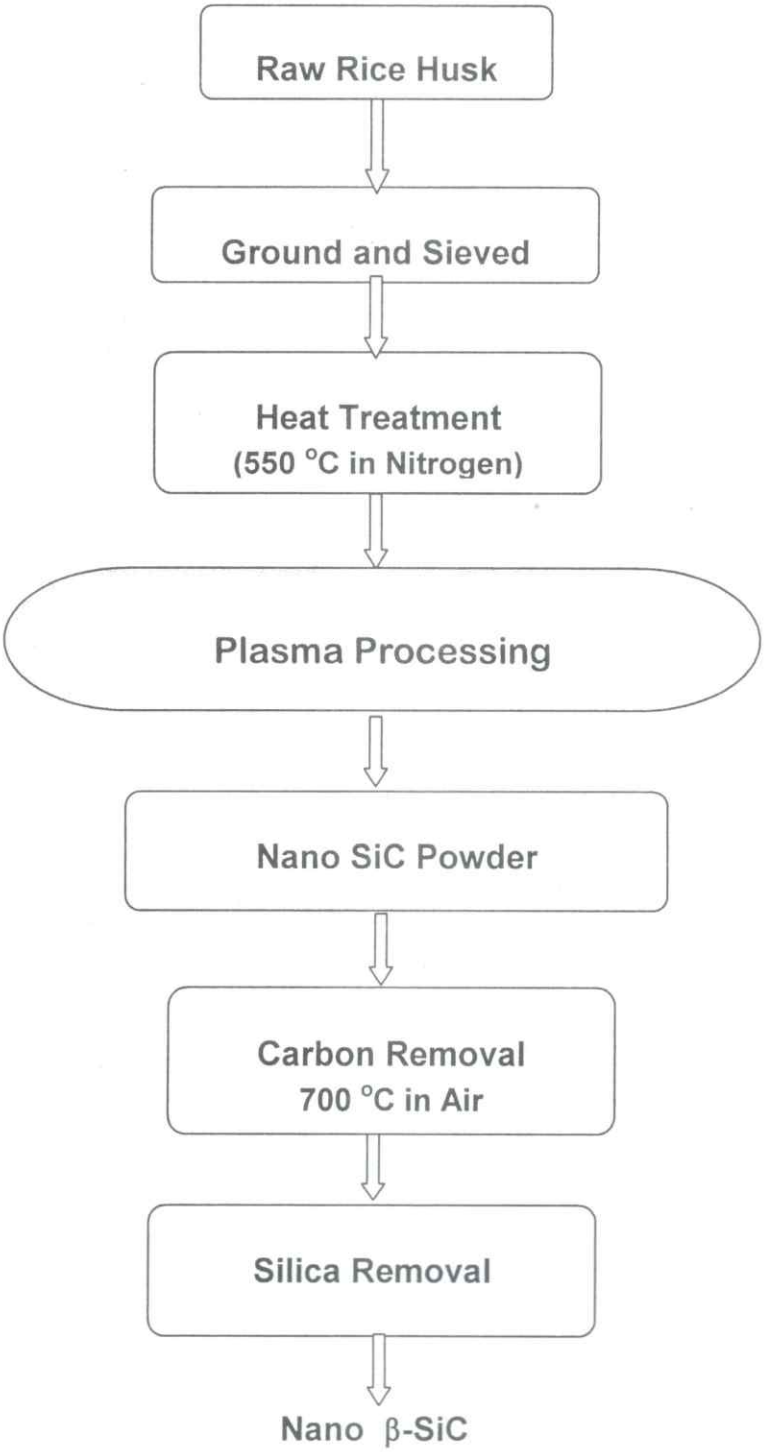

Fig. 1 Flow diagram of the process for synthesis of nano SiC powder from rice husk

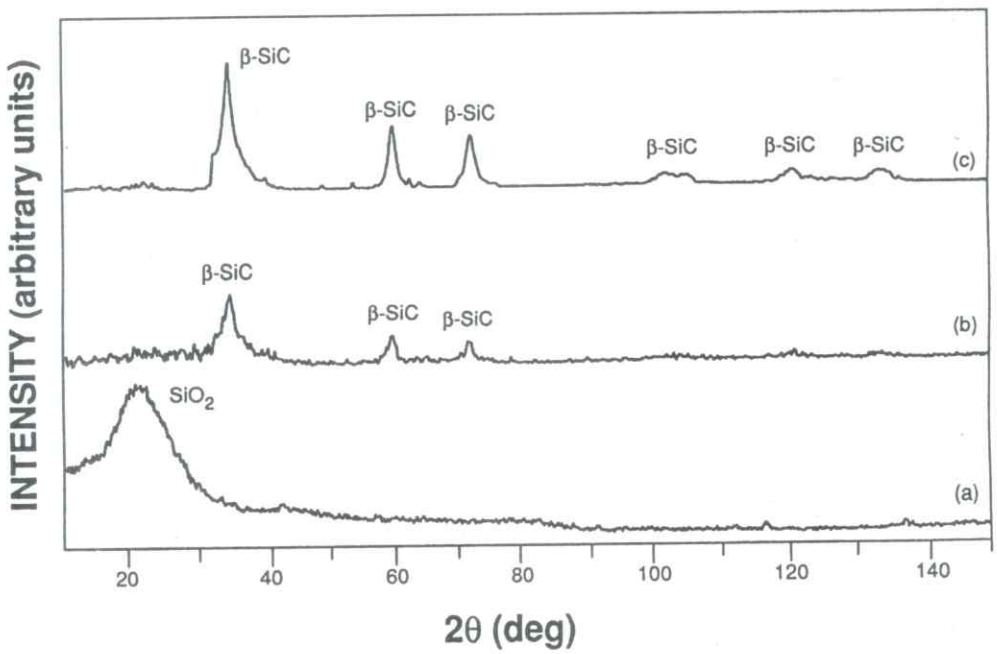

Fig. 2 XRD patterns; (a) Charred rice husk, (b) Plasma treated rice husk, (c) Plasma treated rice husk after oxidation and acid treatment.

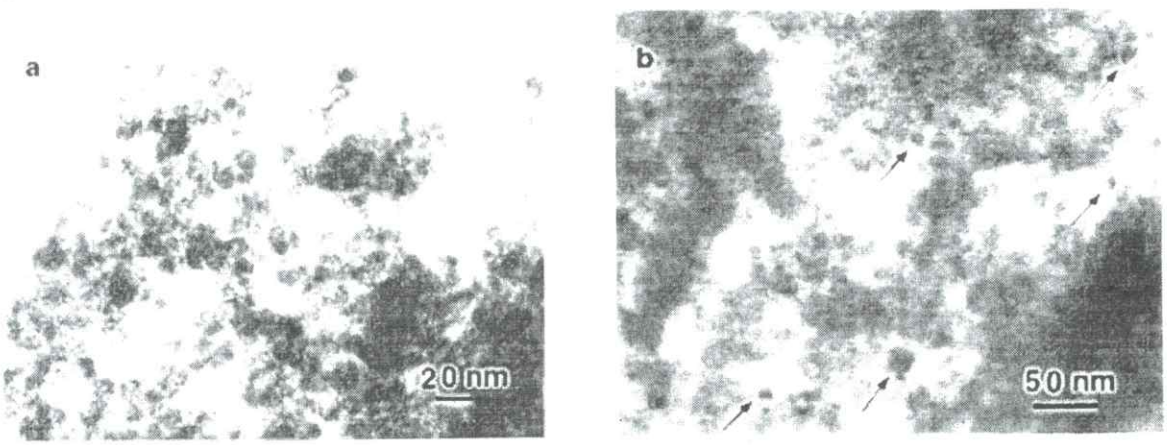

Fig. 3 TEM micrographs (a & b) of the plasma-synthesized SiC powder

CONCLUSIONS

a) Thermal plasma process appears to be an attractive route for continuous production of nano powder.
b) Rice husk, an agricultural waste has been converted to nano-SiC (~ 20 nm), a high valued product in a RF plasma reactor.
c) The present work has two fold advantages; i) a waste is converted to nano-SiC, a high valued product, ii) the nano-SiC derived from rice husk can be used as catalyst support material for abatement of CO emission.

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Vision Document on Mineral Development – 2020 for Orissa

Background

Mineral resources are nature's gift and the State of Orissa is fortunate in having a liberal endowment of a variety of minerals and ores in abundance. It is a well recognised fact that the State's industrial and economic progress depend to a large extent on the systematic exploitation of her mineral resources. It is a matter of great concern why the State has not been able to harness and optimally utilise her mineral resources to bring prosperity for its people. There could be several explanations and alibi. But lack of appreciation, apathetic attitude, absence of a perspective plan of development, meagre outlay for mineral development schemes, archaic procedures, delay in taking decisions and above all absence of a cogent forum are some of the maladies which this vital sector has been subjected to.

A comprehensive basic document which provides information about the mineral resources, status of their exploitation, constraints for development, incentives that could be offered, deficiencies in statutory provisions and procedures and policy to be adopted for accelerated development of the State's mineral resources was not available. Against this background, the State Government considered it necessary to constitute a Task Force in June 1995 for framing a Mineral Policy and preparing a Blueprint of Mineral Development during the decade, 1995-2005. The Task Force could meet only once and it could not prepare this Blueprint.

The Society of Geoscientists and Allied Technologists brought out a volume entitled **"Geology and Mineral resources of Orissa"** in April 1995 which for the first time provided a comprehensive account of geology and mineral resources of the State. The volume has since been updated and reprinted twice.

Since its creation in 1980, SGAT has organised as many as 39 national and international seminars covering all aspects of mineral development.

At the instance of the State Government, Society of Geoscientists and Allied Technologists had prepared a **Blueprint of Mineral Development covering the period 1997-2007**. This was in September 1997.

In the early years of this decade, Department of Steel & Mines took steps to prepare a State Mineral Policy. But this did not materialise.

Following the recommendations of the High Level Committee constituted by the Ministry of Mines, Government of India to review the National Mineral Policy, 1993 and to recommend possible amendments to the M & M (D&R) Act, 1957 and announcement of a National Mineral Policy in 2008, the State Government felt the need to have a road map of Mineral Development of the State covering the period, 2009-2020. SGAT was entrusted with the work.

To facilitate execution of work, SGAT constituted as many as 10 Working Groups. The constitution of the Working Groups are the following.

1.	**MINERAL EXPLORATION**	Dr. M.M. Mukherjee Dr. A. Roy Dr. S. Acharya Dr. N.K. Mahalik Dr. Ravi Bastia Shri Shantanu Mohapatra Dr. R.C. Mohanty Smt. Smita Das Sri Binod Patnaik Dr. B.K. Sahu Shri Janardan Misra Shri B.P. Mishra Shri Subhransu Misra **Shri G.C. Das, Convenor**
2.	**MINING, QUARRYING AND PROCESSING**	Shri S.N. Padhi Shri U.K. Mohanty Shri G.S. Khuntia Dr. R.C. Mohanty Dr. M.S. Roy Shri R.L. Mohanty Shri R.N. Praharaj Dr. S.K. Sarangi Shri Arun Mishra Shri J.K. Hota **Prof. G.B. Misra, Convenor**
3.	**LABORATORY FACILITIES**	Dr. B.K. Mishra Smt. Smita Das Dr. B.K. Mohapatra Shri G.C. Das **Dr. R.K. Paramguru, Convenor**
4.	**LEGISLATIVE PROCEDURES**	Shri R.N. Sahu Shri G.B. Mohapatra Shri A.B. Panigrahi Shri S.N. Padhi Shri R.L. Mohanty Shri R.C. Mohanty Shri Shantanu Mohapatra Dr. V.P. Upadhyay Shri Pravakar Rout Shri K.C. Pradhan Shri N.R. Patnaik **Dr. S.K. Sarangi, Convenor**
5.	**INFRASTRUCTURE**	Shri Sanjay Patnaik Dr. B.P. Das Shri M.V. Rao **Shri Shantanu Mohapatra, Convenor**
6.	**DEVELOPMENT OF MINERAL BASED INDUSTRIES**	Dr. S.K. Tamotia Shri Shantanu Mohapatra Shri Dinesh Shastri Shri Sanjay Patnaik Shri M.V. Rao Shri P.K. Panda **Dr. R.C. Mohanty, Convenor**

7.	**ENVIRONMENT MANAGEMENT**	Prof. M.C. Dash Dr. V.P. Upadhyay Dr. S.K. Sarangi Shri Jiban Mohapatra **Dr. R.C. Mohanty, Convenor**
8.	**EDUCATION AND TRAINING**	Prof. G.B. Mishra Prof. S. Acharya Dr. B.K. Misra Prof. H.K. Sahoo **Prof. N.K. Mahalik, Convenor**
9.	**PERIPHERAL DEVELOPMENT AND CSR**	Shri R.L. Mohanty Shri P.K. Panda Shri R.K. Jena **Dr. R.C. Mohanty, Convenor**
10.	**MINERAL ADMINISTRATION AND ORGANISATIONAL SET-UP.**	Shri R.N. Sahu Shri Janardan Mishra Shri Shantanu Mohapatra **Smt. Smita Das, Convenor**

For carrying out the work, SGAT had interaction with the followings institutions / organisations. *Geological Survey of India, Indian Bureau of Mines, Planning Commission, Ministry of Environment and Forests, Mahanadi Coalfields Limited, CMPDI Limited, OSCOM (Indian Rare Earths Limited), NALCO, OCL India Ltd., FIMI, East Coast Railway, Paradip Port Trust, Eastern Zone Mining Association, Dhamra Port, Gopalpur Port, IMMT, NIT, Rourkela; Orissa Mining Corporation, Directorates of Geology & Mining, Orissa; DMG, Rajasthan; DGM, AP; DMG, Karnataka; Graphite Producers Association, Orissa State Pollution Control Board, CEs of National Highways and Roads, Orissa Sponge Iron Manufacturers Association, Reliance Industries, Balasore Alloys Limited, Mineral Foundation of Goa and GM, BSNL.*

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Vice Chancellor, BPUT
Prof. D.D. Mishra
Former Director, CMRS, Dhanbad
Dr. B.K.Sahu
Emeritus Professor, Department of Earth Sciences, IIT, Bombay.
Prof. G.S.Roonwal
Visiting Professor and former Head of the Department of Geology
Delhi University.
Shri Bhaskar Chatterjee
Principal Adviser, Planning Commission

Execution of the Assignment was co-ordinated by **Shri B.K. Mohanty,** Advisor, SGAT

A job of this type was not only stupendous but extremely difficult to accomplish as information and data required were not forthcoming. With the limitations that we had, we have tried our best to cover all areas relevant to mineral development of the state in the Vision Document. We are conscious of the fact that a report encompassing such a wide range of subjects and activities can not be complete in all respects. There is always scope for improvement.

SGAT honestly hopes, its effort in focussing the ground realities, recommendations and policy framework incorporated in this **Vision Document** will facilitate framing of a State Mineral Policy and implementation of a time bound Action Plan.

Important Milestones in Mineral Development

1837 : Coal was discovered at Gopalprasad in Talcher area
1839 : Coal in Ib river valley was brought to light
1903 : Rich deposits of Iron ore discovered in Gorumahisani hill and mining commenced in 1910
1909 : Rich deposits of iron ore discovered in Joda area
Rampur colliery in Ib river valley opened
1914 : BSL & Co. commenced mining of Limestone in Jagda near Rourkela
1916 : Existence of rich deposits of iron ore in Bolani area was reported
1917 : Thakurani Iron ore deposits were brought to light
1921 : Handidhua colliery in Talcher CF opened
1942 : Occurrence of Chromite reported in Boula- Nuasahi and mining started in 1943
1945 : The first graphite mine of the State was developed at Sargipali in Sambalpur district
: Jeypore Sugar Company limited was the first to instal a ferroalloys (Fe Mn) unit of the state at Raygada
1951 : Sukinda Chromite deposits brought to light. Mining started at Saruabil in 1953
1954 : The first Refractory plant of the State was set up by Orissa Cement Ltd at Rajgangpur
1955 : Directorate of Mining & Geology was created
1956 : Orissa Mining Corporation was established .
1958 : The Directorate of Mining & Geology indicated occurrence of large reserve of Iron ore in DAITARI .
1958 : A FeMn plant was set up by Tata Steel at Joda
1959 : The country's first integrated iron and steel plant in the public sector was commissioned at Rourkela.
The State's first Aluminium smelter came up at Hirakud
The country's first low shaft furnace for pig iron production was commissioned at Barbil by Kalinga Industries of late Biju Patnaik. **This was a significant technological landmark.**
The first cement plant of the State was set up by Orissa Cement Ltd at Rajgangpur
1966 : A modern deep draught port with mechanised handling facilities was commissioned at Paradip entirely due to the bold initiative and vision of Late Biju Patnaik
1967 : The 1960s saw the establishment of FeCr plant by IDCOL at Jajpur Road (1967) and Ferroalloys complex of IMFA Group at Theruvali
1972-73 : Coal mines were nationalised
1976-1980: There was almost 100 fold increase in Bauxite resources following implementation of a massive exploration programme known as East Coast Bauxite project. Jointly undertaken by GSI, DM&G, Orissa and MECL, the project was a significant landmark in the annals of exploration in the country.

1978-82: An integrated detailed exploration programme jointly undertaken by DM&G, OMC, GSI and MECL resulted in an almost ten- fold increase in resources of Chromite in the State.

1980s : The 1980s were marked by establishment of Charge Chrome plants by IMFA Group (1982), FACOR (1983), OMC (1986); the country's first commercial Sponge Iron plant at Palasponga by OSIL (1982), commissioning of OSCOM (1984), establishment of NALCO (1989) and discovery of PGM in Boula area by GSI (1986)

1990s : The 1990s was marked the commencement and completion of UNDP project on Gemstones (1991-97), formation of MCL (1992), High Resolution Aeromagnetic and Radiometric Survey and establishment of a Data Processing Centre by the DoG, Orissa (1993-1998)

BASIC FACTS

1. The entire land area of the State has been covered by First Generation Geological Mapping in 1:50,000 scale.
2. **Status of Mining Leases**

	No.	Area in sq. kms	Nos. in operation
Major Minerals	602	963	376
Minor Minerals (Decorative/Dimension Stones)	169	26	81

3. **No. of MC Applications pending for disposal**

	At the Directorate of Mines as on 1.06.2009
RP	17
PL	509
ML	406
RML	71
PEL	10
	1013

The total no. of MC applications pending for disposal in the State (DoM, Collectorates, S&M Department) is reported to be 8,800.

4. **Mining Revenue**

	(in Rs. crores)
2008-09	1,380.52
2009-10 (Target)	1,600

5. **Administrative and Organisational Set up**
   a. 6 Survey Zones
   b. 14 Mining Circles
   c. 8 Laboratories (4 chemical, 1 ore dressing, 1 petrological, 1 coal testing and 1 gem testing)

Executive Summary

I. Mineral Exploration

1. For a state like Orissa with enormous mineral development potential, efforts to augment the resource base need to be not only sustained on a continuing basis but should be substantially enhanced.
2. Over the years, the techniques of mapping, exploration and assessment of reserves and grade of mineral deposits have been refined with availability of satellite imageries, high resolution aeromagnetic and radiometric data, modern exploration tools, application softwares and laboratory facilities permitting determining upto ppb level. The DoG and other exploration agencies should make full use of all such data and facilities and upgrade the same in conformity with developments in technology.
3. Large scale geological mapping (on 1:10,000 scale) should be taken up in potential areas as a follow up of 1: 50,000 scale mapping.
4. Estimation of reserves should be done as per UNFC system.
5. The important mineral belts by and large have been identified on the basis of work undertaken by GSI, IBM, MECL, AMD, NGRI, Directorate of Mining & Geology (now Directorate of Geology), CMPDI, NRSA, Oil India and World Science Corporation of Australia.
6. The status of work carried by the main exploration agencies like DoG, GSI, CMPDI have been documented.
7. The Data Processing Centre of the DoG should be made fully functional with inputs of essential equipment and personnel. Effort should be made to cover the balance hard rock area of about 30,000 sq. kms. by HR Aeromagnetic survey during the 11^{th} Plan period.

   It is essential to arrange training for a few officers of DoG on application and interpretation of aeromagnetic data.
8. The Geophysical Survey unit of the DoG should be made fully operational.
9. The Drilling unit of the DoG needs replacement of old and obsolete rigs, procurement of at least two RC rigs, vacuum suction rigs and training of personnel.
10. **Exploration inputs needed and priorities have been outlined.**
    These include,
    a. detailed exploration for Coal in 1000 sq. kms. in Talcher basin and 1050 sq.kms. in Ib river basin.
       Emphasis needs to be given for special data generation for new technologies such as **CBM, Coal to liquid** and **UG coal gasification** (CMPDI, GSI, DoG).
    b. exploration for uranium mineralisation in parts of Jajpur, Angul and Keonjhar districts. (AMD).
    c. base metals in the extension areas of known deposits like Sargipalli, Adash, Kesarpur, Kermali, Saintala, Lulung, Pithabata.
    d. gamma-ray logging of all boreholes to be drilled for proving of base metals for possible incidence of atomic minerals.
    e. assessment of **Bauxite** resources with 35-40% Al_2O_3 (DoG)
    f. continuation of assessment of **beach sand minerals** to cover the balance stretch of Orissa coast (DoG).
    g. In regard to **Chromite**, the following action plan is recommended
       i. Depth –wise proving upto minimum 300m vertical depth with a few boreholes to intersect at 500m. depth by deployment of imported drilling rigs.
       ii. Re-assess the reserves at +10% Cr_2O_3 cut-off.
       iii. Assess refractory grade ore including those which can be recovered from friable ore.

iv. Explore possible extension of chromite bearing Sukinda ultramatic complex and Boula - Nuasahi - Bangur belt and the intervening area between the eastern extremity of Sukinda belt and the southern extremity of Bangur.
v. Considering intrusive status of chromite bearing ultrabasic into Daitari Group rocks across the northern fault zone of Sukinda valley, large scale exploration programme should be taken up towards west and north – west of Tomka – Daitari belt. Besides, plug type chromite bearing ortho-pyroxenite are also to be explored towards west and south – west.
vi. Explore the possibility of chromite occurrence in the orthopyroxenites and in the overlying quartzites (Ghotringa quartzite).
vii. Delineate barren areas near the quarries for dumping of overburden.

h. continuation of exploration for **Diamonds** with input of advanced laboratory facilities and expertise.
i. exploration of Eastern Ghats of undivided Koraput district for **Gemstones**.
j. exploration for **Gold** in the Primary and Secondary targets as indicated.
k. For **Graphite,** the approach should be
   i. examine all abandoned mines and dumps
   ii. geophysical survey
   iii. trial excavation and drilling
   iv. examine the tailings of beneficiation plants and graphite occurrences for possible tungsten and REE contents.
l. For **Iron ore,** our future strategy and approach should take into account.
   - proposal of IBM to lower the threshold value to 45% Fe
   - concept of ore genesis, application of all models (syngenetic, supergene and hypogene) and structural control.
   - adoption of latest cost effective and speedy drilling techniques like rotary arc blast and RC besides diamond core.
   - characterisation of ore deposits.
   - beneficiation of BHQ/BHJ and ferruginous shales.

Basing on these concepts and strategy, a 10 year programme should be drawn up for re-assessment of iron ore resources both in the leasehold and free hold areas (large and small) with the DoG as the lead agency, association of GSI and IBM and involvement of DoM. All other stakeholders like FIMI, EZMA, OMC, SAIL, Tata Steel, iron ore mining lessees, NMDC, IMMT, MECON should also be associated in this exercise. Reassessment / Assessment of resources in the following belts and deposits merit special attention;.

i. Daitari, Gandhamardan, Malangtoli, Mankarnacha; Thakurani 'A' Baliapahad, Badamgarh pahar, Khandadhar.
ii. Gorumahisani, Sulaipat – Badampahar.
iii. Proving possible additional resources below BHQ/ BHJ and younger shales.
iv. Re investigation of outlying deposit like Hirapur in Nawrangpur district.

Survey of BMQ is of importance owing its amenability to beneficiation. The megabands of hematite / magnetite in BHJ / BHQ and BMQ should be thematically mapped in respect of facies variation along strike and depth wise extension.

m. low alkali and low silica **limestone** in the known deposits and extension area.
n. re-assessment of **Manganese ore** at 15% Mn cut – off.
o. exploration for **PGM** should be continued and for this, assistance of foreign experts may be sought.
p. special programme for exploration of minerals of stratagic importance for defence and aerospace industry.

q. interaction with Oil India, ONGC, other Oil Exploration Companies and GoI to expedite exploration efforts onshore and offshore.

11. Reassessment of resource and mineable reserves of time demanded important mineral commodities of the State (such as iron ore, chromite, bauxite, manganese, coal, PGM, gold, base metals, minerals sands etc.) should be done on top priority by forming a Task Force comprising the nodal agencies like GSI, DoG, MECL, NMDC, OMC, CMPDI, SAIL, TISCO and other private mining agencies.

12. In order that the recommendations made can materialise, there has to be
    a. substantial augmentation of funds in the State budget
    b. back up laboratory facilities
    c. deployment of trained geoscientists

13. The DoG should prepare a shelf of projects for possible assistance / funding by UNDP, CIDA, other world bodies and foreign Governments like South Africa, France, US, UK, Australia and Russia.

II. Mining, Quarrying and Processing

1. The **Bauxite** deposits explored in great detail should be opened up for mining so that the state gets benefits of revenue and people - employment.

2. Besides IREL leasehold, workable concentration of **Heavy minerals** occur north and south of it. Some action on the ground is needed for working of these prospects for recovery of HM and production of synthetic rutile and thorium.

3. For **Chinaclay**, feasibility of hydraulic mining with simultaneous removal of silica in sluices may be tried.

   Steps may be taken to reduce the size fraction (micron size) of the washed clay so that the product can be used in pharmaceutical industry.

   Establishment of a centralised modern washing plant around Joshipur of Mayurbhanj district to process annually 1,50,000 tonnes of crude clay (which can yield around 60-70,000 tonnes of washed clay). This will benefit small mines who can participate in the equity of the project.

4. In mining of **Chromite,** management of waste dumps is the single most major constraint in Sukinda area. Space available within the leaseholds being non-existent, adequate space for dumping has to be located outside the leasehold areas.

   Pit slope stability study should be carried out to find out the possibility of increasing the slope angle. This will help in lowering of ore: OB ratio and consequently reduction in the volume of OB. Studies should also be carried out to find the optimum height of OB dumps.

   Adequate exploration data at depth so much necessary for designing UG mining is lacking. This lacunae should be overcome.

   The dumps containing more than 10% Cr_2O_3 should be excavated and beneficiated. All mines should set up modern beneficiation plants.

   Fragmentation of ore bodies into several leaseholds is not conducive to scientific mining. It has resulted in blocking of substantial quantities of ore on either side of the boundaries of the leases. Steps should be taken by the State Steel & Mines Department to extract the ore thus blocked in consultation with DGMS, IBM and the concerned lessees.

5. Development of **Coal mines** to meet the demands by 2020 calls for better planning, exploitation and environmental management. Apart from expansion of existing mines, new mines have to be opened by MCL as well as other new lease holders. **The following recommendations are made keeping these objectives in view.**

a) All efforts should be made to ensure the maximum extraction as far as possible so as to improve on the current R/P ratio.
b) Open pits should be so oriented and leaseholds regrouped or readjusted if necessary to this end, that working starts at the outcrop or rise-most end and proceeds in the dip direction until a depth of 250 to 300m or as determined by the economic overburden: coal ratio. This will ensure the major part of the waste dump to be internal. All seams should be mined in the open pit. Leaseholds for underground mining can be allotted beyond the above open pit limit on the dip side.
c) Both overburden and coal benches should be maintained in a regular fashion along the strike.
d) External dumping should be kept to a minimum. This will not only affect the surface topography to the least extent, but also require less land to be acquired, which is a growing problem these days.
e) Internal dumps should be built up to the original ground level. Only towards the dip-most workings it may exceed the original ground level when it should be properly graded and landscaped.
f) All dumps, whether internal or external, should be suitably graded, prepared for planting after proper ground preparation and fertilisation and planted with deep-rooting grass and trees. Wherever necessary surface soil should be stripped separately and spread over the graded waste dump. Where good surface soil is not available or the surface, soil quality deteriorates owing to delay in spreading (the quality of soil not be maintained beyond period of one year) ground quality could be augmented by addition of some fly ash over the graded dump. Addition of fly ash improves stability of the dump and provides mineral nutrient for good plant growth. It also provides a partial use of fly ash produced in nearby power plants. Fly ash pumped as slurry, penetrates into the dump and improves its water holding capacity.
g) Tree varieties should be properly chosen keeping in view that they are fast-growing, sturdy local varieties and capable of sequestration of carbon dioxide by photosynthesis. A suitable mix should be chosen for the purpose. Mines should develop their own nurseries and do their own planting instead of outsourcing this vital environmental restoration work.
h) To completely do away with the problem of fly ash, all new coal-based power plants should be encouraged to adopt the clean IGCC process.
i) Underground mines of Talcher coalfield need to stow the goaf for full extraction. However, there is a scarcity of sand for stowing. Mines may be allowed to excavate and convey sand from river Brahmani and facility should be provided for the same.
j) In view of paucity of sand for stowing, pneumatic or mechanical stowing of crushed rock should be tried. With surface miners excavating overburden, substantial quantities of waste rock in small size range will be available which may be suitable for hydraulic stowing. This should be given a trial.

k) Since surface continuous miners are today used mainly as rippers, they may be replaced by powerful hydraulic rippers, with loading and conveying being done by pay loader dumper combination or even power scraper where haul distance is not large.

l) Surface stock yards should be carefully designed so as to avoid spontaneous heating. In case there is fire, suitable arrangements should be made for fire control by water spraying.

m) Even today, there exist problems of relief and rehabilitation leading to frequent agitation. The large production planned for 2020 will require more surface land to be acquired for mining as well as compensatory afforestation. Steps should be taken right from now to meet the problem.

n) Orissa coal seams have a large number of bands of high ash coal not suitable for power generation. Surface miners can excavate them separately for domestic use after briquetting. Midlings from coal washeries with 50-55% ash can also be used for the purpose. This will substantially relieve the pressure on forests for firewood. **Increasing use of Surface Miners is recommended.**

o) The need for allocation of additional coal blocks for companies of Govt. of Orissa is emphasised.

6. In **Iron ore mining,** as there is no technical shortcoming to use iron ore fines, their optimum utilisation should be ensured.

Future mining should include plan for mining and processing of BIF (BHQ/ BHJ. Ferruginous shales).

A realisation is now built up that mining can not be a fly-by-night operation. It is a long term activity interfering with nature and needs to be carefully planned and scientifically executed with fool proof environment protection measures.

Water being a scarce commodity, recycling of water in iron ore beneficiation should be given a high priority.

Usage of GPS based Truck Dispatch system (TDS) for better management of mines, cost control and maximising productivity of the transportation system should be resorted to in large mechanised mines.

Usage of advanced mine planning software involving Resource Block modeling, Pit optimation scheduling for location and size of dumps, design of haul roads, plants, slime dams is strongly recommended.
Finally, it is highly desirable and appropriate to draw a Regional Development and Environment Management Plan for the iron ore mining regions and implement the same with involvement of all stakeholders.

7. Resorting to mechanisation, the **Manganese ore** producers should take steps for agglomeration of generated fines to improve overall productivity.

8. The Mining industry should strive to achieve zero waste mining by effective management of dumps, utilisation of sub-grade / low grade minerals and waste through appropriate beneficiation and also recycling of water used for beneficiation.

9. The State Government in consultation with DGMS, S.I. and IBM should facilitate extraction of minerals locked up between leasehold areas and in the state boundary.

10. For waste disposal, a co-operative arrangement / system may be developed whereby mined out areas of one lessee is made available to other lessees for backfilling. This will result in reduction in land requirement for dumping of waste and concurrent reclamation.

III. Laboratory Facilities

1. Laboratory facilities available at IMMT, Bhubaneswar; IBM, Nagpur; NGRI, GSI, NML and Directorates of Mines and Geology have been studied.
2. Considerable improvement in the areas of logistics, condition of building, equipment, output and availability of qualified and trained personnel is needed for the Coal Assay laboratory and Chemical Assay Laboratories of the DoM and Ore Dressing Laboratory of the DoG.
3. The control of the Coal Assay Laboratory at Sambalpur and Chemical Assay Laboratory at headquarters should be restored to DoG.
4. Keeping in view the exploration programme envisaged during the next 10 years, the facilities available in the Petrological and Gem Testing Laboratories of the DoG should be upgraded.
5. It is necessary to create pilot plant scale testing facilities at the IMMT, Bhubaneswar along with facilities for analysis of PGM samples.
6. There has to be co-ordination among DoG, DoM, IMMT, GSI, IBM to ensure that the facilities available are optimally utilised.
7. In order to ensure speedy mineral evaculation from the leasehold areas, the State should recognise and accept the chemical analysis report of the laboratories put up by mining lessees equipped with modern equipment such as ICPA (Inductively Coupled Plasma Analyser), XRF etc. and manned by professionally qualified personnel. The State should allow this facility to be used by other lessees at mutually agreeable terms, conditions and rate. The State Govt. may depute its representative to oversee the analysis for which the cost would be borne by the lessee.

IV. Legislative Procedures

1. Views of the Society of Geoscientists and Allied Technologists have been offered on the (a) Recommendations of the High Level Committee, (b) National Mineral Policy, 2008 and (c) Proposed amendments to M & M (D&R) Act, 1957.
2. **In regard to processing and disposal of MC applications, SGAT will like to make the following specific suggestions**
   a) All applications for grant of MC should be submitted to the Director of Mines.
   b) The DoM after scrutiny may send the applications to the District Revenue Authority, DFO (only if forest land is involved) and concerned DDM / MO for their views, in case there is need for the same.
   c) Applications for RP should be processed in the office of the DoM and need not be referred to the District Authorities.
   d) We also suggest that RP applications need not be referred to Central Government for prior approval.
3. Time limits should be fixed for processing and disposal of MC applications at different levels in the State and Central Governments.
4. Submission of MDCC may be dispensed with at the time of application. It may be submitted after the precise area is granted under Rule 22 (4) or prior to execution of lease deed.

5. The Central Government should fix strict time schedule for disposal of Grant / Renewal of Mineral Concession applications. In case the time schedule is not adhered to by the Government, deemed Grant. / Renewal should be allowed provided the application is complete in all respects.
6. Fragmentation of lease areas should be discouraged as lot of valuable minerals are locked up in the boundaries.
7. The State Government should seek amendment to M&M (D&R) Act to exclude Bauxite, Chrome ore, Iron ore, Manganese ore and Precious stones from the list of minerals under Part C of Specified Minerals of the First Schedule.
8. Grant of MC to owners of lands should be facilitated.
9. Reservation of areas for PSUs should be for a limited period.
10. A time limit has to be fixed for disposal of revision applications by the Central Government.
11. The DoM should develop a software to indicate the status of applications on its Website.
12. Besides Minor Minerals, the State Government has been authorised to approve mining plans in respect of a number of non - metallic or industrial minerals specified in Rule 4 (A) of the MCR.
    In our view, the authorisation should include Graphite and Limestone.
13. Further, there is no need for the MOEF and State Forest Department insisting for submission of approved mining plan by the grantee / lessee.
14. Although there is specific mention about the disposal of the application of approval of Mining Plan in Rule -22 (4B) of MCR, no such mention has been made in the OMMC Rules, 2004. This should be specifically provided.
15. **Regarding Technical enquiry, our suggestions are**
    a. entrust the job of technical enquiry to the officers of the Directorate of Geology so that they clear all the pending cases within the next 6 months.
    b. organise a crash programme of training for the officers of DoM who do not possess requisite knowledge of geology, exploration and mining.
16. In regard to **Forest Clearance**, we fully endorse the recommendations of the HLC.
    a) The Central Government has made special provision under Chapter 3.2 (ix) (a) of FC Act Guidelines in which the Central Government/ Central PSU Projects have been exempted from providing certificate of Chief Secretary regarding non - availability of non forest land for compensatory afforestation. They can deposit fund on degraded forest land twice in extent of forest area being diverted.

       The State Governments / State PSUs projects and also the private lessees have been discriminated.

       It is suggested that this special provision may be extended to all other cases.
    b) **The orders of Supreme Court (10 July 2009) to unlock a sum of about Rs. 11,000 crores lying idle in the Compulsory Afforestion Fund Management and Planning Authority (CAMPA) and its release to the states for taking up Compensatory Afforestation is a positive and welcome development.**
    c) There is stipulation in the Forest Clearance that the Lessee will abide by the terms of Regional Wild Life Management Plan approved by the Central Government in the Mining belt. Another condition is also imposed that the Lessee will have to submit a Site specific Wild Life Management Plan for the same Lease before Grant or Renewal. Two such WL plans are

not necessary. Only one Wild Life Management Plan containing all the requirements of Site specific Wild Life Management Plan should suffice.

d) It is observed that in several cases, there is no forest growth of any sort in land recorded as forest area. Therefore, an exercise needs to be undertaken by the State Government with the help of satellite imagery system to identify such areas. On the basis of this study, re-classification of the land should be done in consultation with MOEF.

e) Application of Forest (Conservation) Act should be resorted to in case of mining lease only and certain relaxation / modification in the Forest (Conservation) Act are necessary for RP/PL in the interest of mineral development. In this context, classification of mineral bearing lands and the forest lands need also to be speedily finalised by the State Governments.

f) A number of broken up forest lands, even working mines and lands classfiied as non forest have been put under forests by the DLCs without any field verification. An affidavit to this effect has been submitted to the Hon'ble Supreme Court by the State Government. None in the State Government is prepared to rectify the error committed.

We suggest a fresh look into the matter and proper field verification should be undertaken.

17.a) In regard to **Environment Clearance,** a mechanism for according environmental clearance to mining projects located in clusters may be adopted on the basis of one EIA report at a particular combined threshold level. Any increase beyond threshold may be subjected to fresh environmental clearance.

b) There is no quantitative threshold limit prescribed beyond which EIA may be necessary and clearance is required. It would be appropriate and just if the project authorities are called upon to go for fresh environmental clearance in case there is proposal to enhance the productivity by more than 20%.

c) It is suggested that a single application may be developed for according consent / authorisation under Air, Water Acts and hazardous waste regulation. Authorisation and permission should be given for at least five years. The mining projects having recycling system of effluents should also be considered for water cess rebate as provided in the Law while according consent by the Board.

d) The public consultation process need to be re-examined particularly in case of mining project carrying out expansion within the broken area without acquiring further land beyond the lease area. In such projects public consultation should not be insisted upon and should be waived.

e) The environmental considerations could be better handled if Government makes a policy to carry out at periodical intervals Region - wise carrying capacity exercise so that the environmental parameters with change in micro climatic conditions due to mining and other projects are known to the project proponents for making their own environmental management plans.

18. **Illegal mining, transportation and trading of ores and minerals in the state are rampant and widespread.** The State Govt. has framed Orissa Minerals (Prevention of Theft, Smuggling, Illegal Mining and Regulation of Possession, Storage, Trading and Transportation) Rules, 2007 to curb such illegal activities. The intention and objective of the Rules are undoubtedly

laudable. But there is no let up in clandestine mining, transportation and trading.

Our observations and suggestions on the applicability of OMPTC Rules are the following :

a) DoM was required to produce Transit Pass affixed with Hologram by around 12 October 2008 as per orders of the Commissioner cum Secretary, S & M Department. We understand, this has not been done yet. Use of Duplicate and fake Transit Passes are not ruled out.

b) The field officers are handicapped to take punitive and deterrent measures against the offenders as
The DDMs / MOs can not unilaterally take decision to compound the offence
Minerals, tools, equipment, vehicles seized can not be confiscated without orders of the court
These lacunae need to be looked into and appropriate amendments of the Act and Rules should be sought.

c) The system of Departmental weighbridges and check gates is practically non-functional. A Junior clerk represents the S & M Department in the private weighbridges. This does not serve any purpose. Operation of Departmental WBs/Check gates should be computerized with full proof system to detect and curb illegal movement of ores and minerals. Posting of additional inspective, checking and supervisory personnel, regular and frequent inspection are essential and imperative.

d) Creation and posting of armed squads with modern weaponri and exclusively earmarked vehicles in sensitive areas are strongly recommended.

e) It is necessary to frame clear cut Guidelines for compounding of offences and seizures.

f) In the case of Dimension Stones, royalty is assessed on volume measurement where there is scope for discretion. This can be curbed if frequent and surprise checks are done by supervisory officers.

g) The S&M Department should provide adequate security and protection to the field officers who work under threat of the mafias.

h) District level Task Forces have been constituted under the Chairmanship of respective Collectors for curbing illegal mining, transportation and trading of minerals. The effectiveness of this system leaves much room for improvement.

i) In the Schedule (Rule 2 (1)b), while the jurisdiction of DoM extends over the entire state, his authority is restricted to only "Precious and Semi-precious stones". This should be for All Minerals.

j) It is suggested that a State Level Task Force be constituted under the Chairmanship of the Commissioner cum Secretary, Steel & Mines. The other members may include PCCF, DG of Police, Transport Commissioner and the DoM who is the Member Secretary of the State Level Task Force.

k) The crushers located within the leasehold areas and outside should come under inspection and surveillance of the mineral administration.

19. The Recommendations of the **10th Conference on Safety in Mines** held on 26th and 27th November 2009 at New Delhi are endorsed.

20. **Minor Minerals**

Our suggestions for activating the Minor Minerals Administration and Development are the following.

a. The Director of Geology has been undertaking investigation for assessment of Decorative stone blocks over several years. The Directorate should bring out large scale maps delineating areas containing decorative stone deposits of different colours and texture and reserves there of. This would help in dispensing with the need of obtaining prospecting licence.
b. The Rules surprising do not indicate any time frame for disposal of ML applications. This should be spelt out.
c. Applications filed over non – forest lands need not be referred to DFOs.
d. Minimum area (Rule 6) should not be less than 3 hectares.
e. Government need not be saddled with the responsibility of granting Mining Leases for Decorative Stones. If only delays disposal. The Director of Mines may be authorised to grant leases.
f. The stipulation in Rule 24 to increase royalty by 40% from the 4th year is clearly a disincentive besides being arbitrary. It is not mandatory that the rates would increase every time after expiry of 3 years. *Ad valorem* system may be adopted.
g. The system of issue of transit pass should be streamlined and transparent so that no delay occurs and chance of exercising discretion is minimal.
h. Rule 68 provides for confiscation of minerals tool, equipment, vehicles seized by orders of court. This is not sufficient deterrent to in curb illegal activities. Full powers should vest with officers seizing the materials.
i. Rule 71 provides that if any minor mineral is found in an area leased out for major mineral, the minor mineral can be removed with the permission of the S & M Department. This can be delegated to the concerned M.O/DDM.
j. Rule 25 (23) provides for termination of ML for Decorative stones without payment of any compensation if any other mineral is found in the area is not fair. This calls for appropriate amendment.
k. Prior to August 2004, Leases were being granted for maximum period of 10 years. The new Rules provide for a tenure of maximum 30 years. The leases executed prior to 31 August 2004 may be given option for extension of lease period upto at least 20 years with payment of additional stamp duty.

21. **Mining Revenue**

In regard to fixation of **Royalty Rates**, we recommend

a) deletion of Sec. 9 (2-A) of MMDR Act
b) deletion of the provision of automatic increase of 40% in the rates of SR, DR and Royality for Minor Minerals
c) adoption of *ad valorem* rates
d) asking the Ministry of Mines for one time grant of Rs. 2,000 crores to compensate the loss sustained by the State Govt. on account of delay caused in giving effect to the revised rates of royality.
e) The Steel & Mines Department may take advance action to prepare a comprehensive paper with adequate justification and supporting documents for increase in royalty rates for coal.

Infrastructure

1. It does not require emphasising that development and growth of the Mineral sector is dependant on availability of adequate infrastructure such as roads, railway, ports, telecommunication, power and water.
2. **The sectors of infrastructure essential for sustenance and growth of mineral industry are:**

   Roads
   Railways
   Ports
   Power
   Telecommunication
   Water Supply
   Education
   Health Care
   Sanitation
   Land for disposal of solid waste, housing etc.

3. **Roads**

   3.1 The status of development of roads serving mineral traffic has been indicated. Out of these, the following merit immediate attention for development / completion.

   a. NH 215
   b. NH 5A
   c. NH 200
   d. NH 203
   e. Barbil - Barajamda
   f. Joda - Bamebari - Palasponga
   g. Naranpur - Bamnipal
   h. Tomka - Mangalpur - Duburi - Chorda
   i. Bangur - Bhadrak
   j. Belaipada - Katamati
   k. Sulaipat - Badampahad
   l. Koira - Tensa - Barsua

   3.2. There is delay in completion of road projects in the State by NHAI as reputed contractors are shying away. The reason is uncertainty about collection of toll.

   3.3 It is necessary that all access roads connecting mines / plants with ODR / MDR / SH/NH and Railway sidings are development and maintained by the concerned mines / plant owners.

   3.4 The beneficiaries (owners of mines, plants, crushing units, traders and transporters) should also be required to contribute for development of portions of public roads used for mineral traffic.

   3.5 **The recent plans of GoI to raise whopping Rs. 1 lakh crores for construction of 12,000 kms of highways in the counry and to construct 20 kms a day is welcome and a positive step highly ambitious though.**

4. **Railways**

   4.1 The status of execution of railway projects along with provision of funds during 2009-10 have been indicated.

   4.2 Delay in execution of railway projects is attributed to limited budget, delay in forest and environment clearance, acquisition of land, delay in availability of locomotives and rolling stock.

   4.3 Considering availability of meagre funds from Railway budget for new projects, it is essential to prioritise projects and this exercise should be undertaken jointly by the

Railways, State Government, industry and prospective users. There is no point in pressing for too many projects and ultimately ending with very little.

4.4 The Railway Budget for 2009-10 presented on 3 July 2009 has provided Rs. 715.22 crores as against Rs. 1,500 crores demanded by the State Govt. thereby falling short by a large margin. Provision made for ongoing projects is disappointingly low. Besides, no provision has been made for the following two links :

i) Jeypore – Malkangiri
ii) Badampahar – Keonjhar

5. **Ports**

5.1 The key problem faced by Indian ports is low productivity. The factors responsible have been identified as also areas for private sector investment. The Central Government has allowed Port Trusts of Major Ports to go in for joint ventures with foreign ports. Fiscal incentives in the form of tax holiday for 5 years have been provided.

5.2 ***Paradip***

The port handled a record traffic of 46.41 million tonnes during 2008 – 09 and expects to handle 111 million tonnes by March 2012. It is an ambitious programme dependant on how quickly the modernisation programme is completed. The areas where improvement is needed include

a. creation of additional stockyard capacity
b. creation of container handling facility
c. rate of unloading of rakes and evacuation of empty rakes
d. rate of ship loading
e. rate of wagon tippling by installation of additional tipplers.

With completion of construction of deep draught iron ore berth on BOT basis, the port should be able to handle cape size vessels and of total tonnage upto 16 mtpa.

5.3 While a number of ports are proposed, only ***Dhamra*** is making good progress. The port is being designed to handle 1,80,000 DWT super cape size vessels. A noteworthy feature is a 125m wide corridor between Dhamra and Bhadrak which can accommodate 4 rail tracks, 4-lane road and transmission line. The first phase is expected to be commissioned by the end of 2010.

5.4 Construction of ***Gopalpur*** port is making progress, slow though. Creation of container facility at this port is necessary to promote export of Dimension stones.

6. **Water**

6.1 Water is a critical input.

The State Water Policy assigns a low priority for industries. Requirement of water for different users has been indicated. Among the mining, processing and mineral based industries, thermal power generation consumes lion share of water.

6.2 It is estimated that with the present earmarked water resources, the maximum capacity addition of thermal power generation that can be envisaged is around 27,000 MW.

6.3. The other major users are iron and steel, alumina and aluminium.

6.4. As regards use of water for Thermal Power Plants, the following approach is recommended.

- Dry Ash Disposal system must be compulsorily imposed for all the power plants
- Better water management through adoption of Zero discharge technology.
- The principle of "Polluters must pay" to be applied to meet the expenses of maintaining water quality.
- Encouragement/ incentives should be given to industries for recycling of water. Disincentives will be prescribed for non-recycling of water.
- Rain water harvesting must be encouraged by the Government and the people.

6.5 **Besides thermal power plants, our other suggestions to meet the projected water requirements of mineral-based industries are the following;**

a. Requirement, availability and drawal of water from Brahmani and Mahanadi for all uses need to be reassessed.
b. Creation of storage facilities
c. Rivers of western and southern Orissa and Mayurbhanj district may be considered as potential sources
d. Use of sea water
e. Technology development for reducing consumption, waste water treatment and zero discharge
f. Tapping of Ground water

6.6 Although Industrial Policy Resolution 2007 of GOO stipulates to formulate a comprehensive policy for industrial water drawal after due consideration of the irrigation and drinking water needs, no coherent action has so far been taken. For every basin, the dependability of sources for industrial drawal need to be assessed and drawal be permitted basing on this assessment.

To have an effective allocation, an independent authority be constituted with inter-disciplinafry experts. The present practice of authorisation of surface water withdrawal forn small/medium streams should be vested with the independent water authority.

6.7 The stressed basins are Mahanadi and Brahmani where large number of industries exist and proposed. To be precise, besides Mahanadi and Brahmani, the following rivers/ streams will be the main source of water for the mines and mineral-based industries. They will also carry maximum pollution load.

Ib, Baitarani, Kurhadi nala, Karo, Kundra nala, Damsala

Special schemes should be prepared and implemented to make the rivers Mahanadi, Ib, Brahmani and streams like Karo, Kurhadi, Damsala, and Kundra pollution free.

7. **Power**

7.1 The current installed capacity of energy generation, additional generation proposed, additional capacity projection in 2014 and demand have been outlined.

7.2 Recent Developments

- The National Hydro Power Corporation has agreed to partner the State Government in establishing 12 medium hydro power projects at an investment of Rs 12,000 crores to generate upto 2,000 MW.
- Availability of Water from all sources in Orissa will not permit additional thermal power capacity of more than 27,000 MW. This will need additional Coal production of 160 million tonnes, an increase of 70 million tonnes over the current level in MCL. The environment fallout of such high production of Coal will be severe.

7.3 **These developments and with hydel stations generating power at 25% of capacity (June 2009) question the status of Orissa as a power surplus State and availability of required power for mining and mineral based industries.**

8. **Telecommunication**

8.1 There has been remarkable development in Telecom sector in the country including Orissa. The current status and programme of various services including recently introduced 3G service have been outlined.

8.2 Mineral sector due to its remoteness and non-urban status needs comparatively more efficient services.

Growth of Telecom facilities in the mining and industrial areas of the State is constrained on account of

a. lack of access
b. non-availability of three phase power connection

c. blasting (causes disturbance and disruption)
d. delay due to forest clearance.
e. non-availability of private land / building
f. connectivity by microwave or fibre posing problem
g. difficulty in installation, operation and maintenance in Naxal affected areas
h. continuous damage of optical fibre cable. (OFC) due to road cutting and widening.

These constraints need to be overcome. It will help if the service providers share sites and facilities in remote and hilly area. (It transpires that this has already been initiated).

It will be useful if all new mining and industrial projects have special telecom package right from inception.

9. **Airlines / Airstrips**

The status of the airstrips existing in the State has been outlined. Development of airstrips at the following locations is suggested.

Rayagada, Paradip, Kalinganagar, Angul and Malkangiri.

VI. **Development of Mineral based Industries**

1. It is a well known fact that the Mineral resources of Orissa can support a wide range of mineral industries. These include

Iron and Steel, Ferroalloys, Sponge Iron
Iron ore pellet
Nickel
Alumina, Aluminium
Cement, Refractories
Thermal Power
Chrome and Manganese Chemicals, EMD and Chrome Metal
Titanium Alloys
Lapidary
Granite cutting and polishing
Graphite crucible, electrode, paints
Chrome ore beneficiation
China clay washing
Coal washery

The current status of the industries and development projected have been presented.

2. In the **iron and steel sector,** a capacity build up of 76 million tonnes at an investment of Rs. 198,140 crores have been projected. The available iron ore resources may permit the projected production for about 40 years.
3. The state has potential to reach a production level of 1 million tpa of **ferroalloys** of different types such as FeMn, FeSi, FeCr, FeV, FeTi among others. But availability of power will constitute a major constraint.
4. There is enormous scope for development of **Alumina-Aluminium** production in the state in view of a resource base of 1.5 billion tonnes of bauxite. Production of 7 million tonnes of Alumina, 2 million tonnes Aluminium and 20 million tonnes of Bauxite by 2020 can be targeted. But availability of sufficient water and adequate power will pose problem.
5. Availability of water will not permit **thermal power generation** beyond 27,000 MW, the large resources of thermal grade coal notwithstanding.
6. There are good prospects of establishment of a number of mineral-based industries in the state. But the state Government should be tuned to accelerate the process of
   a) grant of mineral concessions
   b) acquisition of land
   c) forest and environment clearances

d) availability of required water and power
e) assured availability of raw materials
f) curbing lawlessness and disruptive activities

7. The approach of the entrepreneures should be to achieve
   a) integration with the local community
   b) adopting eco-friendly state of art technology with conservation of raw materials, energy and power
8. The sites for industries should be finilised after critical evaluation of all aspects.
9. Industries department should maintain uptodate data and information about the status of mineral based industries, their needs and constraints.

VII. **Environment Management**

1. With the introduction of Forest (Conservation) Act, 1980 and Environment (Protection) Act, 1986 and monitoring by statutory authorities, there has been perceptible improvement in environment management by the mining and mineral-based industries.
2. Considering concentration of mining activities, 15 mining zones have been delineated in the state having impact on environment in varying degree.
3. 12 major industrial areas having mineral-based industries with significant environment impact have been identified.
4. The mining zones and industrial areas should be subject to EIA studies with particular emphasis on carrying capacity.
5. The small mines and stone quarries should be brought within the ambit of EIA.
6. Regional EMP approach is recommended to cover reclamation, rehabilitation, afforestation, waste dumping, drainage control and pollution abatement measures in mines occuring in cluster.
7. The Orissa State Pollution Control Board should be strengthened with posting of full time Chairman and Member Secretary.

VIII. **Education and Training**

1. The status of existing educational and training facilities in Orissa in the fields of Earth Science, Mining Engineering, Metallurgy & Materials Engineering at PG Degree, Degree, Under Graduate and Diploma levels have been reviewed and recommendations have been made for improvement wherever necessary.
2. The status of education in **Earth Science** is poor on account of absence of qualified faculty, laboratory, research and library facilities. Negligible fund provision is a major constraint. Regular field work which is a must for earth science education is having a low priority. No University / Institution teaches Applied Geology and Geophysics.
3. NIT, Rourkela offers B.Tech and M.Tech. courses in **Mining Engineering.** There is no taker for M.Tech. programme. OSME, Keonjhar offers both Degree and Diploma Courses in Mining Engineering. Faculty for teaching at Degree level is inadequate. Kalinga Inst. of Mining Engineering and Technology, Chhendipada offers Diploma course in Mining Engineering. The facilities are adequate.
4. Both NIT, Rourkela and IGIT, Sarang offers Degree Course in **Metallurgy and Material Science Engineering**. NIT also has a PG programme. IGIT has proposed to start a PG Programme by 2010. OSME has a Diploma level course and this is a non – starter.
5. A Degree course in **Mineral Engineering** has been introduced in OSME, Keonjhar without proper faculty and facilities.
6. Although Utkal, Sambalpur, Berhampur and Fakir Mohan University offer PG course in Environment Science, it is not in tune with the upcoming mining and metallurgical industries of the state.

7. **Following are the recommendations :**

7.1 In view of the growing importance of Geoscience to the society, Geoscience should be introduced at secondary school level to provide knowledge on the mineral resources, ground water resources, natural hazards etc. The subject should not get concealed under geography as is now,

7.2 Basic knowledge in Statistics and Computer Science should form a part of Master Programme in Earth Science.

7.3 Teaching geology for Civil Engineers should be reintroduced for a better understanding of the geological environment (e.g. materials of earth's crust, earth forces and hazards) in which Civil Engineers work.

7.4 Intensive field work should be made mandatory both at UG and PG levels.

7.5 Since the PG Geology Department at Utkal University has good infrastructure, it could be developed to a Department of Applied Geology at minimum cost.

7.6 Establishment of a Central University in Koraput has since been approved by Govt. of India. It would be appropriate to introduce a PG Programme in Earth & Environmental Science in the Central University.

7.7 Since an IIT has now been established near Bhubaneswar, it would be appropriate to introduce advanced courses in Geoscience, Mining and Metallurgical Engineering in IIT-B.

7.8 An institute of Earth Science may be set up at Bhubaneswar in the pattern of Institute of Physics, Institute of Mathematics and Institute of Life Science to undertake state of art research on various aspects of Earth Science including coastal studies and natural hazard management.

7.9 Orissa School of Mining Engineering, Keonjhar which offers Mining Engineering at Degree level needs better infrastructure facilities such as strengthening of faculty and laboratory. The Diploma level Mining Engineering at Keonjhar and Chhendipada are in good condition but need further improvement.

7.10. The PG course on **Environment Science** offered by the four Universities should be suitably oriented / upgraded to meet the demands of mining, metallurgical, cement, refractory industries and power plants.

7.11. Finally, the educational institutions should have close and constant interaction with the mining, research and industrial organisations like IMMT, NGRI, ORSAC, GSI, IBM, CMPDI, NALCO, MCL, OMC, EZMA, FIMI, DoG and DoM among others so that they are aware of latest developments and needs.

IX. Reclamation, Resettlement and Rehabilitation (R, R & R)

1. Approach for Reclamation of mined out areas has been outlined. Restoration of mined out lands and green belt development should be managed by a separate Authority or Trust
2. As regards Resettlement and Rehabilitation, it was noted that the R & R policy, 2006 of the State Government is acceptable to all stakeholders
3. The degraded forest lands should be available for R & R.
4. The project authorities are advised to commence work at site after R & R issues are resolved.
5. The affected persons can be partners so that they are fully integrated with the project.
6. It was noted that many NGOs indulge in spreading wrong messages and incite violence. The State Government should counter such malicious activities sternly and ensure that the environment in the project areas is not vitiated by such groups and individuals with vested interest.
7. The sensitivity, culture, livelihood, apprehension and aspirations of the affected persons should be taken care of while finalising R & R package. In this regard, mining community and the media can play major role. Instead of highlighting failures, the benefits that would accrue to the project affected people should be publicised.

8. The mining industry is quite capable of appropriate reclamation of mined out areas by improved technological inputs, dump management, plantation, utilisation of waste and use degraded forest lands under a pragmatic legal system.
9. With plethora of legislations judicial activism, powerful media, the role of the regulatory authorities has become limited resulting in stalling progress of several developmental projects. In spite of these constraints, we can move ahead once we convince the people that the projects will surely bring benefits and prosperity and the administrative set up changes its mindset and tune itself to the development process.
10. Development of industry can not be done in isolation. It has to be integrated with Regional Plan encompassing infrastructure, socio-economic development, compatible EMP and acceptable R & R package.

X. CSR and Peripheral Development

1. The following specific programmes are recommended :
   a) Establishment of modern facilities in Barbil-Joda area for prevention, detection and treatment of **Malaria.**
   b) In Sukinda area-establishment of facilities for detection and treatment of **Cancer.**
   c) Detection and treatment of AIDS
   d) Implementation of drinking water supply schemes in the mining areas.
   e) Regular health check of employees and people living in the neighbourhood of the mines.
   f) Desilting of streams and cleaning of water bodies.
   g) Establishment of technical institutes for training of shot firers, drillers, operators of HEM among others
   h) Upgradation of institutions like OSME, Keonjhar
   i) Development of townships in mining areas with all modern facilities so that the engineers, geoscientists and all other categories of employees engaged by mining companies find it attractive to live in the mining areas and do not opt for other vocations.
2. Every company should earmark at least 5% of its annual budget for CSR and Peripheral Development to be spent mostly within its area of operations and its vicinity. Peripheral development covers areas and activities beyond the company's operational area. This can be best done on a co-operative basis with contributions by the mining industry, transporters, traders, exporters, State Government and GOI.
3. The High Level Committee has recommended setting up Mineral Development Fund in each State by earmarking 15% of the annual royalty collections for the fund. GOI should also make matching contribution to the MDF on annual basis
   [The MDF may be managed by an independent Trust]
   SGAT fully endorses the recommendation of the HLC.

XI. Fiscal incentives, NMP 2008 and Orissa Industrial Policy, 2007

1. The NMP 2008 envisages incentives in the form of import of machineries and equipment which improve efficiency and productivity, financing of mine development and exploration and facilitation of access to risk funds and venture fund from capital market.
2. The Orissa Industrial Policy, 2007 falls short of providing incentives for mining and mineral-based industries.
3. Mineral-based projects which need incentives have been listed.
4. Mining and exploration companies should be allowed to capitatise the cost of exploration.
5. To encourage conservation of mineral resources, the State Government should provide incentives for
   a. reducing waste generation
   b. beneficiation of sub-grade ores and minerals
   c. utilisation of wastes

To give an example, manganese ore fines do not have a ready market but there is demand for Mn-ore agglomerates.

The incentive can be by way of lower rate of royalty and reduced electricity duty.

XII. **Foreign Trade**

1. NMP 2008 encourages export of Minerals in value added form. A long term export policy would provide stability and incentive for investment in large scale commercial mining activity.
2. Suggestions have been made for improvement in export trade of iron ore, aluminium, dimension stones, and ilmenite.
3. **On export of Chromite**
   a. The duty of Rs.3000 per WMT is on the high side. When the export market is depressed, this high rate results in a negative return to the producer of Chrome ore. It would be justified if export duty is fixed at certain % of fob realisation on DMT basis.
   b. A substantial part of export duty earning of GOI should be made available to the State Government to be spent exclusively for infrastructure development and environment management in the Chromite Mining areas.
   c. Commission to MMTC should be reduced to 1%.
   d. Production of concentrates need to be monitored to prevent malafide practice. There is justification to as reduce the cut off grade from 42% Cr_2O_3.
4. In spite of global recession resulting in reduction in demand and sharp decrease in export prices of iron ore in particular, there has not been any drop in quantum of export.

XIII. **Economics of Mining**

1. The economics of a few important iron ore, chromite, bauxite, coal and manganese ore mines have been studied.
2. The study reveals that in spite of global recession, the mining industry has not been adversely affected notwithstanding fall in the margin of profit.
3. In case of export of iron ore, transportation cost accounts for about 50% of the total cost. Therefore, there is need to economise transport cost.

   The export figures of Paradip Port will confirm.

   2007-08 : 12.96 million tonnes
   2008-09 : 14.27 million tonnes

   There has been sharp drop in the quantum of export of Chromite from 0.88 million tonnes in 2007-08 to 0.46 million tonnes during 2008-09.
4. Proposal to impose Service Tax (10.3%) on Railway freight during 2009-10 budget will adversely affect industry and export.

XIV. **Administration and Organisational set up**

1. **Directorates of Geology and Mining**
   1.1 Considering the functions and responsibility assigned to both Directorates of Geology and Mines and the output desired, the personnel in position is grossly inadequate.
   1.2 The Orissa Mining & Geology Service Rules, 1976 is now 33 years old. It calls for immediate revision and updating. There are instances of officers (Geologists) recruited more than 25 years ago continuing in the same post. Not a single promotion has come their way. This should not be allowed to continue.
   1.3 Periodical Cadre Review with emphasis on improving effciency and professionalism at all levels is essential.
   1.4 Training is an important component of any development activity. Apart from availing training programmes offered by GSI, IBM and other institutions, both DoG and DoM should organise in-house training programmes / refreshers courses.

1.5 Besides the offices, the DoM should regularly inspect mines, check-gates and sensitive mining area known and prone to clandestine mining. Similarly, the DOG should inspect the mineral investigation projects on regular basis.

1.6 The jurisdiction of Deputy Director of Mines, Koraput extends over the districts of Koraput, Malkangiri, Nawrangpur and Raygada. Creation of a separate mining circle at Rayagada having jurisidction over the district of Rayagada will be justified.

1.7 The Department should bring out Executive Instructions supplementary to the amended M.C. Rules,1960 and update it as and when needed.

1.8 There is need to have a cell to look after Mineral information, intelligence, statistics and publications with regular updating of status of mineral concessions, working of mines, production, export among others.

1.9 The importance of Minor Minerals as a source of revenue, provider of employment and catalyst for rural development has been highlighted. This sector merits increasing attention.

1.10 To effectively check illegal mining, transportation, smuggling we have suggested posting of special armed squads in sensitive areas, modernization of weighbridges and check gates and their effective functioning.

1.11 The DoM should be suitably strengthened with regard to manpower and logistics to effectively oversee the following activities;

a. Development and Administration of Minor Minerals.
b. Prevention of illegal mining, smuggling, transportation and trading.
c. Involvement in Environment management, Infrastructure development, CSR and peripheral development.
d. Upgradation of Mineral Intelligence set up.

1.12 The control of the chemical laboratory at headquarters should be restored to Directorate of Geology.

1.13 Framing of a State Mineral Policy was attempted a couple of years ago. Steps may be taken to complete this exercise.

1.14 The Plan outlay for S & M Department has been pegged at a paltry sum of Rs. 3.79 crores, which amounts to approx 0.11% of the total plan outlay for the state.

As regards Non-plan, provision for S & M Department is Rs. 32.17 crores and this works out to roughly 0.13% of the state's total Non-plan budget.

The plan and future programme of the S & M Department will remain on paper unless the too dismal outlay provided in the budget is substantially augmented.

1.15 The mining areas are often the target of maoists violence. There is need to take effective steps to put a stop to such activities.

2. Orissa Mining Corporation

We would like to make the following observations and suggestions.

a) OMC is headed by a part time Chairman. It should be headed by a full time CMD (who may be an IAS officer). A permanent post of Director (Technical) may be created who should be No. 2 in the organisation. The D(T) should possess either a PG Degree in Geoscience or a Degree in Mining Engineering.

b) The main wings of OMC, namely, Mining and Geology are headed by Additional General Managers while other wings are headed by GMs and ED. Mining and Geology wings should be headed by GMs, preferably Executive Director. They should report to Director (Technical).

c) We had pointed out the disincentive nature of OMC's R&P Rules in our observations in the Blueprint of Mineral Development in Orissa in 1997. There has been no improvement since. The officers of "Geology" wing continue to be at a disadvantage with extremely restricted promotional avenue. This needs redressal. We recommend adoption of time scale.

d) Periodic Cadre Review should be undertaken in the interest of the Corporation and career prospects of its employees.

e) We recommend that the Personnel Administration be headed by an officer qualified and conversant in HRD. HRD pattern in organisations like NMDC and NALCO may be examined for adoption by OMC.

f) Administration of leases and mines leave much room for improvement. The first and foremost task is to secure orders of renewal for 33 out 35 leases held and to resume operations in the mines lying dormant for years or closed due to one reason or the other. A special task force should be constituted for the purpose and progress reviewed on weekly basis.

g) OMC's mines are being worked through raising contract. This is not a healthy practice. The Corporation should develop expertise to work the mines departmentally.

h) It transpires that the chrome ore beneficiation plant at Kaliapani is being operated or contract basis. This we feel is not a desirable approach.

i) For a premier PSU of 53 years standing, record of R & D is rather dismal. A competent and qualified geoscientist / mineral technologist / metallurgist with research experience should be inducted to head the R & D wing.

The specific programmes for R&D to be taken up by OMC can be identified by a Committee of Experts. It is necessary to set apart a certain portion of the annual budgetary provision for R&D, which qualifies for deduction under the I.T Act.

j) OMC's record in environment management and monitoring is not satisfactory. There has been practically no progress in regard to reclamation of abandoned and barren quarries, management of solid waste and plantation / afforestation. The Corporation should have a full fledged Environment Management Cell under the charge of a General Manager (Geology). It may be worthwhile to requisition the services of an experienced Environment Scientist. OMC should have close interaction with the Forest Research Institute. Dehra Dun; Plant Resources Centre, Soil Conservation Directorate for building up an effective Environment Management and Monitoring Cell.

k) Training of personnel, continuing education and refresher courses should constitute important part of OMC's activity. Specialised programmes, training courses and short courses offered by GSI, IBM, ISM, Dhanbad; IITs, NMDC, CSIR laboratories, CMPDI, NRSA, AMD, NGRI among others should be availed. OMC should have close interaction with institutions like IMMT, Bhubaneswar, ORSAC, OSPCB, MOEF, DM&G, NIT, Rourkela; PG Departments of Geology of Utkal, Sambalpur and Berhampur Universities.

l) Induction of Management trainees at entry level is desirable.

m) Technical personnel should be encouraged to go for advance training and higher studies abroad, to present technical papers in journals of national and international seminars.

n) Drilling for assessment of reserve and mine planning is an important and indispensable activity. Unfortunately, the present set up is not in a happy situation both in regard to personnel and equipment. Replacement of old and obsolete rigs due years ago, has not been carried out. Immediate action is called for revamping of the drilling set up and its modernisation with induction of RC and vacuum suction rigs.

o) Almost all the chromite mines under operation by OMC will soon reach the opencast quarrying limits necessitating recourse to Underground Mining for extraction of ore at depth. There is urgency for advanced planning and simultaneously strengthening of the mine design set – up. The mine planning and design set-up as also mechanised mines like Daitari IOM and Kaliapani chromite mines should necessarily be manned and headed by Mining Engineers holding Degree in Mining Engineering.

p) OMC may create a fund for promotion of education and research in the fields of geoscience, mining, mineral beneficiation, marketing, social welfare,environment management among others and institute scholarships for meritorious students for study and research in India and abroad.

q) There is scope and need for up-gradation of information management including data bank system and software development in appropriate areas.

r) Periodical open house discussion and interaction may be held to enable the employees to express their view on the various activities and programmes of the Corporation.

s) OMC should have a long term plan of CSR and Peripheral Development in conformity with best practice available

t) Vigilance and security should be beefed up at all establishments of OMC particularly Daitari IOM, COBP at Kaliapani and Explosive Magazines. Particular attention should be paid to prevent and put a stop to plundering of ores and minerals from leasehold areas.

u) Long term interest of OMC will be better served if its (i) finance, (ii) sales and marketing (iii) personnel administration are headed by professionals.

3. Since the establishment of a regional office of the DGMS at Bhubaneswar almost 30 years ago, there has been massive expansion in mining activities in Orissa. There is ample justification for creation of a zonal office at Bhubaneswar with jurisdiction covering the entire state of Orissa and parts of A.P. and Chhatisgarh. Creation of Regional officers at Rourkela or Sambalpur, Barbil and Koraput would be fully justified.

4. The office of the Deputy Director General of GSI at Bhubaneswar should be vested with full administrative and financial powers.

5. The Regional office of the IBM at Bhubaneswar should be provided with essential inspecting personnel.

6. Orissa now accounts for 25% of the total reserves of coal of the country and currently contributes around 25% of the country's production too. With almost 100% increase in coal production projected in the state around 2017 and Talcher contributing most of it, creation of a separate company for Talcher CF will be justified.

7. At present, there is no co-ordination among the various organisations and institutions involved and associated with mineral development activities in the State and neither there exists an effective forum for interaction. The S & M Department will find it worthwhile and rewarding if the defunct **Mineral Development Board** is revived and made functional.

- **EMAP 2008-09**

State Level Environment cum Mineral Awareness Programme (EMAP) 2008

Regional EMAP was orgnaised in 10 major mining and industrial areas of the State and Bhubaneswar during September to December 2008. All the 11 best school teams selected from each region comprising of two students accompanied by a teacher participated in the State Level EMAP organized at Bhubaneswar on 9th & 10th January 2009.

In this 19th Environment cum Mineral Awareness Programme (EMAP) of SGAT at Bhubaneswar sponsored by Orissa Mining Corporation Ltd., the following schools participated:

1. B.K. High School, Soso
2. Daitari High School, Daitari
3. Sargu Kisan Vidyapitha, Tunmura
4. Ispat High School, Tensa
5. Kerala Public School, Rairangpur
6. DAV Public School, Chandrasekharpur, Bhubaneswar
7. Belpahar English Medium School, Belpahar
8. Delhi Public School, Damanjodi
9. Saraswati Sisu Mandir, Joda
10. DAV Public School, Anant Vihar, Talcher
11. De Paul School, Berhampur

The programme comprised:

Besides visits to (a) Regional Science Park, (b) Regional Museum of Natural History, (c) Meteorological Centre, (d) State Museum and (e) Regional Plant Resource Centre, identification of plant species and mineral samples, photographs, written test and oral quiz were conducted. Belpahar English Medium School represented by Abhijit Padhi and A.S. Sarangi was adjudged the overall best team.

Prof. G.B. Mishra, Vice President, SGAT, Shri R.N. Parida, Director - Geology, Orissa, Dr. V.P. Upadhyay, Director, MOEF, Govt. of India awarded certificates and prizes to all the participants and mementos to accompanying teachers.

Dr. R.C. Mohanty, in his presidential address thanked the OMC Management for sponsorship and evaluators and examiners of various events who helped in conducting the programme.

The State Level EMAP was attended by Executive Council and several members of SGAT, representatives of Mining Industry, Officers of DOG, OMC, GSI, Tata Steel among other. The various tests and quiz programe were conducted and evaluated by Dr. N.K. Mahalik, S/shri T. Mahanta, Subhransu Mishra, J.P. Behera, Bikas Sahu of DOG. Dr. T. Basa of OMC and logistic input was provided by GEOMIN GROUP.

Shri M.V. Rao, General Secretary offered formal vote of thanks. The programme was designed and co-ordinated by Shri B.K. Mohanty, Advisor, SGAT.

➢ NEWS ABOUT MEMBERS

- **Mr. Sanjay Patnaik** is now Chief, Raw Materials Strategy Group of Tata Steel and posted at Jamshedpur.

- **Mr. Rajesh Chintak** is now CRE, Tata Steel, Orissa at Bhubaneswar

- **Mr. Santosh Misra,** former Scientist, IMMT, Bhubaneswar has been awarded Ph.D. in Geology from Utkal University.

- **Mrs Smita Das,** Council Member of SGAT has retired as Director of Geology, Orissa on superannuation on 31.12.2008.

- **Mr. Jyoti Ranjan Patnaik,** member of SGAT assigned as Direector of Geology, Govt. of ORissa on 1st April 2009.

- **Mr. Binod Chandra Patnaik,** Jt. Secretary, SGAT has assigned as Jt. Director Level-1, Govt. of Orissa on 28.10.2008.

- **Dr. S.K. Sarangi,** Vice President, SGAT is elected as Vice President-I in the National Council of Mining Engineers Association of India for the term 2009-2011.

- **Mr. Santosh Kumar Patnaik,** member of SGAT is elected as a member in the National Council of Mining Engineers Association of India for the term 2009-2011.

- **Mr. J.K. Nanda,** Dy. Director General, Geological Survey of India, retired on superannuation.

OBITUARY

SGAT express deep condolence on the sad demise of the following members.

- **Sri Srinibas Sethy** expired on 22nd November 2008.

- **Sri Smruti Ranjan Mohapatra** expired on 3rd December 2008.

- **Sri Basudev Satpathy** expired on 5th January 2009.

- **NEW MEMBERS**

1. **Mr. Yashwant Singh Thakur**
A6/11, Mayapuri Apartment
Nagewsar Tangi
Bhubaneswwar – 751 002

2. **Dr. R.S. Goyal**
D-10, Vishwavidyalaya Puri
Gopalpura Road
Jaipur - 302018

3. **Mr. Mohammed Yusha**
Chairman
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mohammedyusha@yahoo.com

4. **Mr. Dushmanta Kumar Mahanta**
Sr. Manager (Geology)
Rungta Mines Ltd.
Jajang Iron & Mn. Mines
At/Po: Jajang – 758052
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Cell No. 9437437153

5. **Mr. Samarendra Mohanty**
Geophysicist
Duplex No. 04, Ratna Village
Bomikhal, Bhubaneswar

6. **Dr. Rajesh Mukherjee**
Sr. Geologist
Joda East Iron Mine
Tata Steel Ltd.
General off. Bld. Tata Steel
3rd Floor, Commercial Centre,
Natural Resources Div. Tata Steel
Jamshedpur – 1

7. **Mr. Asim Chatterjee**
Regional Geologist, Tata Steel
General off. Bld. Tata Steel
3rd Floor, Commercial Centre,
Natural Resources Div. Tata Steel
Jamshedpur – 1

8. **Mr. Sudarsan Bhanja**
Manager
Murgabeda Iron Mines
M/s D.R. Patnaik
42, Ashraya (S.P. Swain),
Brahmeswar Patna
Bhubaneswar

9. **Dr. Erick Raymond Ramanaidou**
Arrc Csiro
Po Box – 1130
Bentley Wagio – 2
Australia

10. **Dr. Ashok Kumar Srivastava**
Chief Mining Geologist
Indian Bureau of Mines
CPWD Bunglow
12/1, Seminary Hills
Nagpur – 440 006

11. **Mr. Bijoy Chandra Jena**
former Chairman, GRIDCO
former CMD, OPDC &
Member, OERC
522, Saheednagar
Bhubaneswar – 751 007

AWARDS 2009

- **SGAT AWARD OF EXCELLENCE – 2009**

Nominations are invited for SGAT Award of Excellence – 2009 in the Proforma enclosed. Persons awarded in the past should not be re-nominated. The proforma (7 sets) completed in all respects and duly signed by the proposer should reach the General Secretary, SGAT at 267, Kharavela Nagar, Bhubaneswar – 751 001 on or before 31st October 2009.

The Award will be in the form of a citation and a cash award.

Any person (member or non member) who has made outstanding contribution in the field of geosciences, mining, metallurgical and mineral process engineering, mineral beneficiation, environmental management in mines or whose work has helped in upgrading the quality of life in mining environment or whose work has led to significant development of mineral resources of a region, state or country shall be eligible for the award. Self nomination is possible.

1. Name of the persons proposed :
2. Date of birth :
3. Designation & address :
4. Educational qualifications
5. Professional experience :
6. Membership of Professional bodies :
7. List of publications with names of journals :
   Vol. and Issues (if possible, send important reprints)
8. Details of outstanding work
   (Please attach a separate sheet)
9. Any other information

Signature

Place:

Date:

Full name and address of the
Member/Institution proposing

- **SITA RAM RUNGTA MEMORIAL AWARD**

Nominations are invited for Sita Ram Rungta Memorial Award in the proforma given below. Any person (member or non-member) who would have made significant contribution in Mineral Exploration, Planning and/or Mineral Beneficiation involving utilisation of mine waste/sub-grade ores and minerals will be eligible for the Award. Persons awarded earlier should not be re-nominated. The Award will be in the form of a citation and cash. Self nomination is possible.

Proforma for Nomination

1.	Name of the persons (in Block letter) proposed	:
2.	Date of birth	:
3.	Designation & address	:
4.	Educational qualification	:
5.	Professional experience	:
6.	Membership of Professional Bodies	:
7.	List of Publications with names of Journals (Issues/volumes) if Possible, send important reprints	:
8.	Details of outstanding work (Please attach a separate sheet)	:
9.	Any other information	:

Signature

Place:

Date:

Full name and address of the Member/Institution proposing

Note:

The work should be original, innovative and of applied nature in the areas of Mineral Exploration, Planning and/or Mineral Beneficiation involving utilisation of mine waste/sub-grade ores and minerals leading to its productive adoption in the field level.

The nomination (in 7 sets) in the prescribed proforma should reach the General Secretary, SGAT at 267, Kharavela Nagar, Bhubaneswar – 751 001 on or before 31st October 2009.

➢ OTHER NEWS

❖ DIARY OF EVENTS

- 28-30 October,2009 - International Seminar on Mineral Processing Technology (Mineral Processing Plant Practices), Venue: Institute of Minerals & Materials Technology (IMMT), Bhubaneswar organized by Institute of Minerals & Materials Technology (IMMT), Bhubaneswar & Indian Institute of Mineral Engineers (IIME). Contact: Mr. P.S.R. Reddy, Convener, MPT-2009, Institute of Minerals & Materials Technology (IMMT), Bhubaneswar–751013,Orissa, India, Tel: 0674-2581635/636/638/639 Extn.-536, Fax: 0674-2581160/ 2581637,E-mail: psrreddy@immt.res.in;mpt2009@immt.res.in, Web: www.immt.res.in/mpt2009.

- 1-4 December, 2009 - International Symposium on Magmatic Ore Deposits (Covering Cr, PGE, Ni-Cu-Sulphide System), Venue: Institute of Minerals & Materials Technology (IMMT), Bhubaneswar organized by Institute of Minerals & Materials Technology (IMMT), Bhubaneswar, National Geophysical Research Institute, Hyderabad and Geological Society of India, Bangalore and Society of Geoscientists and Allied Technologists, Bhubaneswar. During the Seminar, a short course on **New Developments in Magmatic Ni-Cu and PGE Deposits** by Prof. Tony Naldrett, Prof. Edward M. Ripley and Dr. Chusi Li shall be organsied with a course fee of Rs. 3000/-. A field trip to Boula-Nuasahi Ultra-mafic complexin Keonjhar district of Orissa is also being organized on 04.12.2009 with a field trip fee of

  Rs. 1000.00/US$100. Contact: Dr. G.V. Rao, Convener, ISMO-2009, Institute of Minerals & Materials Technology (IMMT), Bhubaneswar – 751001, Orissa, India,Tel:06742581635/636/638/639 Extn.-472,(Mobile-+919937519181) Fax: 0674-2581160/1581637, E-mail: gvrao@immt.res.in.

❖ NEWS ABOUT DIRECTORATE OF GEOLOGY, ORISSA

- 5 new Bauxite bearing plateau in Dasmantpur block of Koraput district have been explored and resources are established.

- The drilling operation in Kalamidadar valley has indicated existence of diamond bearing pipe.

- Additional iron ore resources in Sundergarh district has been indicated 2 inventory work.

- Additional Limestone resources are explored in Khariar area.

❖ NEWS ON MINING IN ORISSA

- Mineral Resources in Orissa as on April 2008

  Iron Ore-5230 Million Tonne
  Coal -65263.39Million Tonne
  Bauxite-1797.12 Million Tonne
  Chromite-176.59 Million Tonne
  Manganese-120.76 Million Tonne
  Limestone-1010.25 Million Tonne

- Mining Revenue collected during 2008-09: Rs. 1380.52 crores.

- The leases for different minerals in the State - 602
  Operating leases- 376
- Total production of different minerals in 2008-2009 - 1890.09 Million Tonne
- Proposed to undertake drilling operating for 12000 mtrs. to explore various mineral deposits in Orissa.
- Total MoU signed for 49 Steel industries by the Govt. of Orissa out of which, 28 plants are in operation.
- Annual production target for proposed 49 Steel plants is about 75.66 MT with an investment of about Rs. 198140 crores.
- As on today, direct employment in these plants are 16490 and indirect employment is about 39908.

❖ STATE GEOLOGICAL PROGRAMMING BOARD

The 43rd meeting of the Board was held on 27th June 2009 under the Chairmanship of Dr. A.M.R. Dalwai, IAS, Commissioner-cum-Secretary, Dept. of Steel & Mines, Govt. of Orissa. The meeting was organized by the Directorate of Geology, Orissa. Representatives from Steel & Mines Dept., GSI, Orissa Circle, OMC, SGAT, IMMT, IBM, CMPDIL, CGWB, AMD, MECL, GWS&I, Dept. of Geology, Utkal University and IDCOL have participated in the discussion mainly on the review for exploration undertaken in the State of Orissa during 2008-09. Members also discussed on future strategy of activities for 2009-10 field seasons. The deliberation was mainly aimed at proving of additional resources of Iron, Bauxite and Manganese in the State of Orissa.

❖ INDIA – Niyamgiri bauxite production starts

Vedanta Resources expects to start bauxite mining from the Niyamgiri mines in the Kalahandi district of Orissa, India, by August. The mining project has already received environment and stage I forest clearances. Vedanta has set up a 1 million tonne alumina refinery at Lanjigarh in the Kalahandi district through its group company Vedanta Aluminium and has also set up a 0.25 million tonne aluminium smelter along with a 675mw captive generating plant at Jharsuguda. Vedanta has formed a joint venture company with Orissa government-owned Orissa Mining Corporation (OMC) through its group company Sterlite Industries (India) for mining bauxite from the Niyamgiri mines.

OMC has bauxite leaseholds over an area of 721 hectares in the Niyamgiri forest. Of this, 672 hectares are forest land and 49 hectares wasteland. The Niyamgiri mines contain an estimated 76 million tonnes of bauxite and the mining facility will have a capacity to annually raise 3 million tonnes. Vedanta Aluminium vice-president (mines) Prasanna Panda says, "Everything is ready. Once we get the stage II forest clearance, we will start the mining operation immediately." The stage I forest clearance was provided in December 2008 with 2 onditions besides 16 general stipulations and the company has already complied with the directives and environmental clearance was granted at the end of April. Vedanta plans to augment the capacity of its alumina refinery to 5 million tonnes/year from the present 1.4 million tonnes and the aluminium

smelter to 1.75 million tonnes from 0.7 million tonnes.

Source: Asian Miner News Service

❖ **INDIA – Sesa Goa acquires Dempo assets**

Sesa Goa has agreed to acquire the assets of Dempo Group, including mining leases, rights and related infrastructure in Goa, India.

Sesa Goa, which is part of the Vedanta Group of companies, signed an agreement to acquire VS Dempo and Co, which owns 100% of Dempo Mining Corporation and 50% of Goa Maritime.
Vedanta Group chairman Anil Agarwal says the integration of Sesa and Dempo's operations will achieve greater synergy and it is an opportunity to consolidate the company's iron ore business.
Dempo, one of the largest exporters of iron ore from Goa, owns the rights to mineable reserves and resources estimated at 70 million tonnes of iron ore. Its assets include processing plants, barges, jetties, trans-shippers and loading capacities at Marmugao port. It produced 3.94 million tonnes of iron ore and sold 4.36 million tonnes in the latest financial year.

Dempo has been involved in iron ore mining, beneficiation and exports for nearly 60 years. Sesa Goa, a large iron ore exporter, has also diversified into the manufacture of pig iron and metallurgical coke. The company has mining operations in Karnataka and Orissa, and operates a 280,000 tonnes/year metallurgical coke plant and a 250,000 tonnes/year pig iron plant in Goa. It exported about 8 million tonnes to China in 2008-09.
Mines in the Goa area have lower costs as they are near the port, and avoid road and rail charges.
India produces more than 200 million tonnes of iron ore annually and exports about half the production. There are about 500 mines held by about 80 companies, however, only 250 mines are operational.

Source: Asian Miner News Service

❖ Tata Steel to become 10-mn ton company by March
❖ India to clear Posco's mining lease proposal soon

Source: Steel World News Digest

❖ **FORTHCOMING EVENTS**

1 August 2009: Workshop on "Requirement of Power for Mining and Mineral Based industry in Orissa"

Venue:	Hotel Swosti, Bhubaneswar
Contact:	Mr. M.V. Rao, Convener M: 9437023952

21 & 22 August 2009: Mineral Development Quiz (MDQ) Programme

Venue:	Hotel Swosti, Bhubaneswar
Organiser:	Sri B.K. Mohanty, Advisor, SGAT Tel: 0674-2431909

- **The AGM for the year 2009 of SGAT will be held on 19.12.2009 at 5.30 pm at Bhubaneswar.**

- **SUBMISSION OF PAPERS FOR SGAT BULLETIN**
  (Instruction to Authors)

Research papers, review articles, short communications, announcements and letters to editors are invited on topics like geosciences, mineral exploration, mining, materials science, metallurgy, mineral industry and trade, mineral economics, environment, education, research and development, legislation and infrastructure related to mining, mineral policy and mineral development planning.

Submission of manuscript implies that the same is original, unpublished and is not being considered for publication elsewhere. Two copies, complete in all respect (with copies of figures and tables) are required to be submitted. Originals of figures and tables should be enclosed separately. Each manuscript must accompany by a computer diskette (floppy) containing the electronic version of the text. Electronic files of figures, if available, should be submitted in a separate diskette. In each case, the details of software and type of equipment used should be clearly indicated. The copies of manuscripts, strictly in accordance with the instructions to authors given below may be sent to the editor of the bulletin.

Journal Format: **A-4 size**
Language: English
Manuscripts: Manuscripts should be typed in double spacing with wide margins in one side of A-4 size paper either by electronic typewriter or computer (size 12 point Times New Roman font). The title page should include the title of the paper, name(s) of author(s) and affiliation(s). The title should be as brief as possible. An informative abstract of not more than 500 words to be included in the beginning. Not more than 5 key words are to be listed at the end of he abstract. Text of research papers and review articles should not exceed 4000 words. The short communication is for quick publication and should not exceed 1200 words.

Headings: Different headings should be in the following format.

(a) Title: Centrally aligned, bold, capital
(b) Author(s): Centrally aligned, short name, bold, first letter of all words capital followed by communication address (Not Bold)
(c) Abstract: Left aligned, bold
(d) Key words: Left aligned, bold
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(h) Acknowledgements: Left aligned, bold, first letter capital
(i) References: Left aligned, bold, first letter capital
(j) Figure Caption: Left aligned, first letter of first word capital, below the figure
(k) Table Caption: Left aligned, first letter of first word capital, at the top of the table

Illustrations: All illustrations should be numbered consecutively and referred to in the text. They should confirm to A-4 size and carry short captions. Lettering inside figure should be large enough to be accommodate up to 50% reduction. One set of hard copy of all figures (either tracing in ink or laser prints) should be provided in a separate envelope marked "Original Figures". Photographs should be of good quality with excellent contrast, printed on glossy paper. Colour photos are acceptable, provided the author(s) bear the cast of reproduction. Figure captions should be provided on separate sheet.

Tables: Each table must be provided with a brief caption and must be numbered in the order in which they appear in the text. Table should be organised within A-4 size and should be neatly typeset for direct reproduction. Tables will not be typeset by the printer, so their clarity and appearance in print should be taken into account while the author(s) prepare(s) them. Use of 10

points Time New Roman/Arial Font for table is recommended.

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(a) References in the text should be with the name of the author(s) followed by the year of publication in parenthesis, i.e. Patnaik (1996); Patnaik & Mishra (2002); Nayak et al. (2001)

(b) Reference list at the end of the manuscript should be in alphabetical order, in the following format: Sehgal, R.K. and Nanda, A.C.(2002) Palioenvironment and palioecology of the lower and middle Siwalik sub-groups of a part of North-western Himalayas. Jr. Geol. Soc. Ind, vol. 59, pp. 517-529

(c) Articles from the books should follow the format given below:Windley, B.F. and Razakamanana, T. (1996) The Madagascar – India connection in a Gondwana framework. In:Santosh, M. and Yoshida, M. Eds.) The Archaean and Proterozoic terrains of South India within East Gondwana. Gond. Res. Group Mem. No.3, Field Sci. Publ., OSAKA, pp. 25-37

(d) Books should be referred to as: Sengupta, S.M. (1994) Introduction to sedimentology. Oxford and IBH Publ. Co. Pvt. Ltd., New Delhi, 314 pp.

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