

# Curriculum Vitae

## Section A

<b>Name</b>	<b>Dr. Hrusikesh Mishra</b>
<b>Specialization</b>	<ul style="list-style-type: none"> <li>(a) Coal Petrology of Indian, Australian &amp; Indonesian coals for their characterization &amp; its application to coal /coke, steel and allied industries.</li> <li>(b) Utilization of NLW (Non Linked Washery) coal for Blast Furnace coke making.</li> <li>(c) Identification of raw materials for metallurgical industries</li> <li>(d) Coal &amp; mineral characterization through instrumental method of analysis</li> <li>(e) Phase analysis of coal, coal ash, minerals through XRD and SEM studies.</li> <li>(f) Advance Technique of coal and minerals beneficiation</li> <li>(g) Alternative Energy Resources</li> <li>(h) Source rock evaluation in oil &amp; natural gas exploration.</li> <li>(i) Coal-Bed Methane exploration; Coal liquefaction, Fuel Technology, Coal Carbonization</li> <li>(j) Coal Exploration &amp; its resource assessment.</li> </ul>

## Section B – Education

Degree/ Examination	University/Institution	Year	% of mark	Specialisation
Ph.D	University of Wollongong, New South Wales, Australia	1987	-	Coal Petrology
M.Sc.	IIT Kharagpur	1976	75.03	Applied Geology
B.Sc.(Hons)	Utkal University	1974	71.03	Geology
I.Sc.	do	1972	66.0	Science
Matric	BSE,Orissa	1970	69.0	Matric-

## Section C – Doctoral Degree

Doctoral Degree	University/Institution	Year awarded	Guide/Mentor	Specialisation
A comparative study of Permian coals of India and Australia	University of Wollongong, New South Wales, Australia	1987	Prof.A.C.Cook	Coal Petrology

## Section D –Five best papers in SCI Journals

Author	Title	Journal	Volume	Pages	Year	Online link to proceedings
Mishra HK, Cook AC	Petrology and thermal maturity of coals in the Jharia basin: implications for oil and gas origins.	International Journal of Coal Geology	20	277- 313	1993	<a href="http://www.sciencedirect.com/science/article/pii/016651629290018R">http://www.sciencedirect.com/science/article/pii/016651629290018R</a>
Mishra HK, Ghosh RK	Geology, petrology and utilization potential of some Tertiary coals of the northeastern region, India.	International Journal of Coal Geology	30	65-100	1996	<a href="http://www.sciencedirect.com/science/article/pii/0166516295">http://www.sciencedirect.com/science/article/pii/0166516295</a>

Mishra HK	Comparative petrological analysis between the Permian coals of India and Western Australia Palaeo environments and thermal history.	Palaeogeography, Palaeoclimatology Palaeoecology	125	199-216	1996	<a href="http://www.sciencedirect.com/science/article/pii/S0031018296000314">http://www.sciencedirect.com/science/article/pii/S0031018296000314</a>
Mishra HK, Chandra TK, Verma RP	Petrology of some Permian coals of India.	International Journal of Coal Geology	1	47-71	1990	<a href="http://www.sciencedirect.com/science/article/pii/0166516290900130">http://www.sciencedirect.com/science/article/pii/0166516290900130</a>
Mishra HK, Maitra J, Sharan PK, Shrivastava BBP	Petrographic composition of some of East Bokaro coalfield with special reference to beneficiation studies and depth of burial.	Recent research in economic geology	1	97-128	1998	<a href="http://scholar.google.co.in/citations?user=C0M0dFMAAA&amp;hl=en&amp;oi=ao">http://scholar.google.co.in/citations?user=C0M0dFMAAA&amp;hl=en&amp;oi=ao</a>

### Section E– Best five papers in Conference proceedings

Author	Title of paper	Name of conference	Conference date	Year of publication	Online link to proceedings
MishraHK, Das TK, Maitra, Imam Z, Saran S and Debnath AK	Reduction of BF cost through effective utilization of Indian LVHR and low rank coking coals in blend-A petrographic approach	66th Annual Meeting and Symposium of International Committee for Coal & Organic Petrology (ICCP)	Sep 20	2014	<a href="http://dspace.nitrkl.ac.in/dspace/handle/2080/2192">http://dspace.nitrkl.ac.in/dspace/handle/2080/2192</a>
Mishra H.K and Chopra, R.K	Utilization of non coking coals for Blast Furnace Coke Making.	17 th International Coal Preparation Congress	Oct 1 ,	2013	<a href="http://scholar.google.co.in/citations?user=C0M0dFMAAA&amp;hl=en&amp;oi=ao">http://scholar.google.co.in/citations?user=C0M0dFMAAA&amp;hl=en&amp;oi=ao</a>
Mishra H.K and Singh A.K	Coal petrography And beneficiation studies of low volatile high rank coal of Damodar valley basin: Implication for augmentation of coking coal resources in India	34th International Geological Congress	Aug 5	2010	<a href="http://scholar.google.co.in/citations?user=C0M0dFMAAA&amp;hl=en&amp;oi=ao">http://scholar.google.co.in/citations?user=C0M0dFMAAA&amp;hl=en&amp;oi=ao</a>
Singh AK,, Sahay AN and Mishra HK	Use of LVMC coals in blast furnace coke making to improve availability of Indian coking coals	Asian Mining Congress, Resurgence of Mining in Asia: Prospects and Challenges	Jan 3	2010	<a href="http://scholar.google.co.in/citations?user=C0M0dFMAAA&amp;hl=en&amp;oi=ao">http://scholar.google.co.in/citations?user=C0M0dFMAAA&amp;hl=en&amp;oi=ao</a>
Mishra HK, Maitra J, Imam Z, Mukherjee TK, Mishra BN	Petrology and thermal Maturity of source rock through Petrographic Image Analysis (PIA).	First Conference and Exhibition on Strategic Challenges and Paradigm shift Hydrocarbon Exploration with Special Reference to Frontier Basins	Sep 4	2002	<a href="http://scholar.google.co.in/citations?user=C0M0dFMAAA&amp;hl=en&amp;oi=ao">http://scholar.google.co.in/citations?user=C0M0dFMAAA&amp;hl=en&amp;oi=ao</a>

## Section F– Sponsored Research Project handled as Principal Investigator

Funding Agency	Title of the Project	Project cost	Project Duration	Status	Remark
Ministry of Coal, Govt. of India	Development of methodology for characterisation of Indian coals by computer aided petrographic image analysis	Rs.94.89 Lakh	1996 -2001	Completed	Under my leadership the project titled "Development of methodology for characterization of Indian coal by computer aided petrographic image analysis" was implemented and report was submitted to Govt. of India in January 2001. This project was conceptualized to develop a methodology for rapid characterization of Indian coal through computer aided petrographic image analysis (PIA) to locate additional indigenous coal resources, which could be utilized in the steel industry there by reducing import of coal from the world market. The project has earned appreciation from the Members of Standing Scientific Research Council of Ministry of Coal, Govt. of India.
Coal India Ltd	"Resource survey, characterization and blending studies of low volatile coking coals for their use in steel industry	Rs.457 Lakh	1997 -2002	Completed	Under my leadership the project titled "Resource survey, characterization and blending studies of low volatile coking coals for their use in steel industry" was implemented and report has submitted to Coal India Ltd. R&D Committee in September 2002. The project has earned appreciation from the Members of Coal India Ltd. R&D Board
Coal India Ltd	"Characterization of cleats in coal from Raniganj and Jharia coalfields "	Rs.240.35 Lakh	2002- 2006	Completed	Under my leadership the project titled "Characterization of cleats in coal from Raniganj and Jharia coalfields "is being implemented since June 2002. The project has been designed for generating data on coal cleats for different applications in the coal industry as well as coalbed Methane (CBM). For exploration and assessment of CBM, intensive field study related to cleat frequency, dimension, orientation, etc., supported by laboratory experiments (coal petrography, cleat study Through SEM/XRD) are being undertaken for the first time in the country.
Coal India Ltd	"Resource assessment and characterisation of non-coking coals for sponge iron industry."	Rs.295 Lakh	2005- 2008	Completed	The CIL R&D project was completed in 2008. Extensive research work has indicated that most of the Indian non coking coals can be used for Sponge Iron industries after suitable beneficiation.
Coal India Ltd	Effective utilization of low rank and low volatile high rank coals for blast furnace coke making	Rs.285Lakh	2009 -2013	Completed	Cost of BF Coke accounts more than 50% in production in hot metal through BF route. This has shown a sharp increase in last few years due to rise in both international and indigenous coking coal prices. A joint CILSAILR&D project was completed recently for identification of means for using cheaper (Low Volatile High Rank (LVHR) and low rank Indian coking coal in blends for BF coke making. Detailed number of sources of LVHR and low properties of the different coals investigated and approaches for effective utilization these rank Indian coking coals has

Department of Science & Technology	Estimation & simulation of gas permeability as well as stress & strain behavior of Indian coal seam for CBM production and CO <sub>2</sub> sequestration at insitu condition.	35 Lakh	2014-2018	ongoing	been carried out. This paper describes the characterization of cheaper coals in the blend. Project in progress
Coal India Ltd	Assessment of the coke making potential of NLW coal and Jhama	Rs.180 lakh	2017-2020	Submitted to CIL	This joint project will be carried out between NIT, CMPDI and SAIL. It is in final stage of approval.

### Section G - Membership of Professional Societies

<b>Full Member</b>	International Committee for Coal and Organic Petrology
<b>Member</b>	Bureau of Indian Standards Solid Mineral Fuel sectional Committee PDC-7
<b>Life Member</b>	Mining, Geological and Metallurgical Institute of India (MGMI)
<b>Life Member</b>	Association of Economic Geologists

### Section H- Employment Record

Over 35 years of professional experience (since January 1978) with Central Mine Planning & Design Institute Ltd., Ranchi, India, 834008 and three years as Visiting Faculty (on contract) in the Department of Earth and Atmospheric Sciences, NIT Rourkela (Since 24<sup>th</sup> March 2014 till 23.03.2017. Guest Faculty in NIT Rourkela from 27.03.2017 to 31.05.2017. Joined as Visiting Professor in NIT Rourkela on 19.06.2017.

CMPDI is a wholly owned subsidiary of Coal India Limited (a US\$ 8 billion corporate house that contributes to 90% of the total coal production in India). It is an ISO-9001 consultancy organization offering full-range of services to a host of clients in India and abroad in the sphere of earth resource exploration, development, utilization, management, as well as engineering and environmental management.

Established two Departments in NIT Rourkela in 2014 which offers M.Sc. Applied Geology and M.Sc. (Atmospheric Sciences) in Earth and Atmospheric Sciences in NIT Rourkela. One state of art Coal Petrology lab and Ore Geology was established during my tenure in NIT Rourkela from 2014-2017.

	Job Title	Responsibility
<b>24.03.2014 Till date</b>	<b>Visiting Professor (on contract) in Earth Atmospheric Sciences, NIT Rourkela</b>	Teaching, research, sponsored research and consultancy, guiding research at ,PG and Ph.D levels, framing of Curriculum and syllabi and guiding in setting up of laboratories in the new Department of Earth and Atmospheric Sciences, NIT Rourkela.
<b>06.03.2013 To 31.1.2014</b>	<b>GM/HOD (Geology/CT/Lab) CMPDI Ranchi</b>	To supervise the work of Coal Technology /Chemical & Petrography Labs of CMPDI. Coordination with CSIR Labs for coal core analysis for Geological Report Preparation. Implementation of CIL and S&T Projects. Establishment of new Regional Chemical Labs at RI-VII & RI-V.
<b>01.08.2013 To 05.03.2013</b>	<b>GM/HOD (Geology/CT/S&amp;T/ Blasting/Labs) CMPDI Ranchi</b>	In addition to Geology and Labs charge of HOD of S&T/CIL R&D / CT/Lab/Blasting was given. This assignment was completed successfully
<b>22.03.2013 To 01.08.2012</b>	<b>GM/HOD (Geology/Lab) CMPDI, Ranchi</b>	To supervise the work of Geology /Labs, vetting of Geological reports, preparation of Geological reports, Lab related work, tech. co-ordination of work of RI-VII'. Project, leader of on going CIL R&D Projects. Co-ordination with CSIR Labs for coal ore analysis.
		<b>Head (Coal Petrography Laboratory) and Project Coordinator</b>

<b>Feb. 1994 to 21.03.2010</b>	<b>Dy. Chief of Geology [M-1]</b>	(a) Development of methodology for characterization of Indian coal by computer-aided petrographic image analysis; (b) Resource assessment of low volatile coals of India for use in steel industry; (c) Characterization of cleats in coals of Jharia and Raniganj coal basins (d) Resource assessment and characterisation of non-coking coals for sponge iron industry (e) Effective utilization of low rank and low volatile high rank Indian coking coals for BF coke making.
<b>Aug. 1988 to Feb. 1994</b>	<b>Suptdg. Geologist [E-5]</b>	<b>Project Leader</b> (a) Quality assessment of coking coals of India; (b) Resource assessment of non-coking coals and lignites of India.
<b>Mar. 1984 to Aug. 1988</b>	<b>Dy. Suptdg. Geologist [E-4]</b>	<b>Project Associate</b> (a) Quality assessment of coking coals of India; (b) Resource assessment of non-coking coals and lignites of India. <b>On study leave at University of Wollongong, NSW, Australia.</b>
<b>Mar. 1981 to Mar. 1984</b>	<b>Senior Geologist [E-3]</b>	<b>On study leave from 22 Feb.1982 to 26 Octo.1986 at University of Wollongong, NSW, Australia on a commonwealth Scholarship to complete PhD in Coal Geology/Coal Petrology.</b>
<b>Jan. 1978 to Mar. 1981</b>	<b>Geologist [E-2]</b>	<b>Project Member</b> Project Member Multi-disciplinary integrated coal exploration project of CMPDI (involving planning, implementation and monitoring) in the states of Chhattisgarh, Maharashtra and orissa, as officer in charge/Geologist in camps of Belpahar Tekadi & Patharkhera. Awarded Best Officer In-charge in Belpahar camp best award in 1981

## Section I- Significant Achievements/Contributions

<p><b><u>At NIT Rourkela from 24.03.2014 to till date</u></b></p> <p>I joined in the new Department of Earth &amp; Atmospheric Sciences on 24.03.2014 on a “visiting Faculty under contract”. I was appointed initially for one year and extendable up to three year subject to renewal by the competent authority. My service was extended annually on approval by the competent authority on relevance of his service to the institute. My contract is due to expire on 23.03.2017.</p> <p>I was able to give the required leadership at the early stage of development of a new Department of Earth and Atmospheric Sciences. I worked for overall development of the department in teaching, guiding PG students in research, framing of curriculum and syllabi and setting up of laboratories with dedication and responsibility. I taught the basic subjects as well practical subjects in both semesters (ER- 511 Physical Geology, ER-517 Stratigraphy, ER-519 Fuel &amp; Economic Geology, ER-582, Coal Geology Lab, ER-571 Crystallography &amp; Mineralogy Lab, ER-591/592 Research Project, ER-593/594 Seminar &amp; Technical Writing, etc. In the current semester I am taking courses on Fuel and Economic Geology (ER-519), Coal Geology Lab (ER-517), Research Project (ER-592); and Seminar and Technical Writing (ER-798).</p> <p>I have established a Coal Geology Lab and Microscope Lab for students/faculty for study of coal, pellets, and rock/mineral thin sections. Further, M.Sc. (Applied Geology) students are doing final year project work under his supervision for the year 2016-17.</p> <p>I am a Co-Principal Investigator of an approved research project on Estimation and simulation of gas permeability as well as stress-strain behaviour of Indian coal seam for CBM production and CO<sub>2</sub> sequestration at in-situ conditions” (project code MN-ESS). The project is approved by Science and Engineering Research Board, DST and the total grant sanctioned is Rs.39, 13,200. The project was commenced on 01.01.2015 and duration of the project is three year (Likely date of completion 01.01.2018). I have submitted a CIL Research &amp; Development project on “Assessment of coke making potential of NLW coal and Jhama” to CMPDI Ranchi on 24.09.2016 in which he is the Principal Investigator. This is a joint project of CMPDI Ranchi, NIT Rourkela and RDCIS SAIL Ranchi. The total grant for NIT Rourkela will be Rs.18, 43,000. In addition, I render valuable service in technical</p>
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interaction of various industries viz. MCL, CMPDI, SAIL, TISCO, Coal India Limited, etc. with the department.

#### **Significant Contribution CMPDI: Characterization of Low Volatile High Rank (LVHR)/NLW (Non Linked Washery) Coal**

Indian steel industry encounters a unique problem with respect to availability of good quality coking coal in the country. Out of 34.06 billion tonnes of coking coal reserve, around 27.06 billion tonnes are medium coking coal and in which approx. 8.4 billion tonnes fall into Low Volatile High Rank (so called LVHR)/NLW coal. These coals, at present, are classified as Non-Linked Washery (NLW) grade and are being used for non-metallurgical purposes. These coals have difficult-to-very-difficult washability characteristics due to presence of high Near-Gravity-Material (NGM) i.e. more than 30% at desired cut gravities (i.e. material falling between  $\pm 0.1$  cut gravities) As such these coals are not linked to washery and are called '**Non-Linked Washery**' (NLW).

These coals are of high rank (with Vitrinite reflectance  $R_r\% > 1.2\%$ ), high inertinite content, low reactive content (30-45%), low volatile matter content (18 to 22% or so), high ash ( $> 30\%$ ) and therefore, having lower coking propensities with difficult cleaning characteristics and hence categorized as Non-Linked Washery coal (NLW). However, these coals can be suitably utilized by steel industries after proper beneficiation and blending with matching coals. These coals generally occur in the lower seams of Jharia Coalfield (Combined seam V/VI/VII/VIII)) and Karo group of seams (seam VI to XI) in the eastern part of East Bokaro Coalfield.

The laboratory and pilot plant coal beneficiation and characterization study have demonstrated that the clean coals ( $17\pm 0.5\%$  ash) obtained from these coals after effective beneficiation have shown considerable improvement in coking properties. The yield percentage is also encouraging and hence, these coals can be considered for utilization in metallurgical industry as a blend constituent in coke making.

Blending study of the clean coals of V/VI/VII/VIII combined seams of Jharia coalfield with prime, medium and imported coking coals showed that up to 30% usage of these coal in the blend does not impair coke properties when ash content of clean coal is brought down to  $17\pm 0.5\%$ . Utilisation of LVHR /NLW coals after suitable beneficiation can produce to the tune of around 6 to 8 million tonnes of blendable coking coals, thereby, providing much needed raw materials indigenously for the expansion of our steel industry. Import burden of coking coal will reduce substantially to the tune of US \$ 780 million.

The washing cost of the LVHR/NLW coals was economically not viable earlier due to low recovery of metallurgical coal compared with the price of imported coking coal. But in present scenario as compared to imported coking coal price, the washing of these coals is economical even up to 18% yield if the second product (middlings) is used as power grade coal.

On the basis of the finding of the beneficiation and characterization study undertaken by me, Coal India has taken initiative to set up six washeries totaling about 18.6 million tonnes capacity for washing current production of LVHR/NLW coal in BCCL. Another washery of 2.5 million tonnes capacity has been envisaged to wash LVHR coals at CCL on turn key basis. After installation of the new washeries CIL can take advantage of 25-30% yield of these coking coals in Jharia and East Bokaro Coalfields. The middlings shall be used in power sector.

#### **SECTION J - Academic and Research Experience**

Adjunct faculty in IIT Bhubaneswar. Completed a course in Coal and Petroleum Geology (ELSL302) in August 2014. Under took Technical session on coal and coke petrography in Tata steel Jamshedpur during 19-22 Aug 2015.

Supervised one M.Sc. (Applied Geology) 2014-2016 batch NIT Rourkela on "Characterisation of Korba coals and its utilization potential for sponge iron industry. Supervising four students of 2015-2017 batch M.Sc. (Applied Geology) on CBM, Shale gas and coal as a source for hydrocarbons.

Supervisor to one Ph.D. thesis work titled *Geological and petrographic controls for coal-bed methane (CBM) in Jharia coalfield* at Indian School of Mines, Dhanbad.

Examiner to M.Tech. & Ph.D. thesis work:

- Petrographic studies of some coal seams in Raniganj coalfield for CBM [M.Tech. (Petroleum Engg.), Indian School of Mines, Dhanbad];
- Mineralogical and geochemical studies of solid wastes from Rourkela Steel Plant, Orissa [Ph.D. (Geology), Utkal University, Orissa];
- Mineralogical formation, Iron ores and associated rocks around Badam Pahar region, Mayurbhanj district, Orissa - their structure, stratigraphy and chemistry [Ph.D. (Geology), Utkal University, Orissa].
- Tertiary coal belt in eastern Kalimantan, Indonesia: The influence of coal utilisation [Ph.D. (Geology), University of Wollongong, NSW, Australia].

(e) The petrology and Utilisation of Tertiary Brown coal Mae Moh Basin, Northern Thailand [M.Sc. (Geology), Curtin University, WA, Australia].

Examiner: Merit and Normal Assessment Scheme of CSIR (*Council of Scientific & Industrial Research of Govt. of India*) Scientists at Regional Research Laboratory, Bhubaneswar; Central Fuel Research Institute, Dhanbad; Birbal Sahni Institute of Paleontology, Lucknow.

External supervisor to Ph.D. work and guest faculty for postgraduate teaching at Ranchi University, Jharkhand [1989 till date].

Faculty for continuing education at Indian Institute of Coal Management, Ranchi for training of executives of the Indian Mineral Industry [1997 till date].

Faculty for continuing education at Staff Training College of CMPDI and Central Coal Fields LTD(CCL), Ranchi for training of executives of Coal India Ltd [1987 till date].

CSIR Junior Research Fellow at Indian Institute of Technology, Kharagpur, in the project titled *Temporal variation of deep sea carbonate oozes from the Indian ocean* [Nov. 1976 to Jan. 1978].

## Section K – Publications

List of candidate's most significant publications			
Sl. #	Name of Authors as they appear in each paper	Title of the Paper	Name of Journal, Volume, Year & Page
1.	<b>Mishra HK</b>	Petrographic investigation in coal exploration.	Mine Tech 1989; 10(1): 27-46.
2.	<b>Mishra HK</b> , Chandra TK, Verma RP	Petrology of some Permian coals of India.	International Journal of Coal Geology 1990; 1: 47-71.
3	<b>Mishra HK</b> , Cook AC	Petrology and thermal maturity of coals in the Jharia basin: implications for oil and gas origins.	International Journal of Coal Geology 1992; 20: 277-313.
4.	<b>Mishra HK</b> , Verma RP	Coal Petrology and coalification trends in the Permian coals of Damodar Valley basins, India.	29 <sup>th</sup> International Geological Congress 1992; Kyoto, Japan, p.821.
5	Maitra J, <b>Mishra HK</b> , Maitra A.	Estimation of ash content in coal by petrographic method.	Mine Tech 1993; 14(3): 28-29.
6.	Shrivastava BBP, <b>Mishra HK</b>	Petrology, depositional environments and utilisation potential of some Pench-Kanhan coals, Madhya Pradesh.	Proceedings of 4 <sup>th</sup> Asian Mining Explorations and Environment. Mining, Geological and Metallurgical Institute of India 1993, Oxford and IBH, Calcutta, pp.59-104
7	<b>Mishra HK</b> , Sinha AS	Permian coals of India and Tanzania.	Mine Tech 1994; 15: 55-60.
8	<b>Mishra HK</b> , Shrivastava BBP	Permian coals of Collie basin coals and South Perth basin of Western Australia and Son-Mahanadi and Godavari Valley basin of India.	Proceedings of 9 <sup>th</sup> International Gondwana Symposium 1994; pp.1245-1256.
9.	Veevers JJ, Tiwary RC, <b>Mishra HK</b>	Gondwana coal-bearing fan of east-central Gondwana land platform disrupted by late Triassic-Jurassic rifting.	Proceedings of 9 <sup>th</sup> International Gondwana Symposium 1994; pp.637-646.
10	Shrivastava BBP, <b>Mishra HK</b>	Classification of coking coals-a petrographic approach.	Mining, Geological and Metallurgical Institute of India-MGMI News 1995; pp 1-21.

11.	<b>Mishra HK</b>	Comparative petrological analysis between the Permian coals of India and Western Australia-Paleoenvironments and thermal history.	Palaeogeography, Palaeoclimatology, Palaeoecology 1996; 125: 199-216.
12	<b>Mishra HK, Ghosh RK</b>	Geology, petrology and utilization potential of some Tertiary coals of the north-eastern region, India.	International Journal of Coal Geology 1996; 30: 65-100.
13	<b>Mishra HK, Maitra J, Sharan PK, Shrivastava BBP</b>	Petrographic composition of some of East Bokaro coalfield with special reference to beneficiation studies and depth of burial.	Economic Geology 1998; Hindustan Publishing Corporation, New Delhi; Vol.1, pp.97-128,
14	<b>Mishra HK, Mukherjee TK, Mishra BN.</b>	Petrology of Gondwana and Tertiary coals of India-implications for oil, gas and CBM exploration.	Proceedings of First Conference and Exhibition on Strategic Challenges and Paradigm-shift Hydrocarbon Exploration with Special Reference to Frontier Basins, Mussoorie, Sept 2002; Vol.2; pp 13-20.
15	<b>Mishra HK, Maitra J, Imam Z, Mukherjee TK, Mishra BN</b>	Petrology and thermal Maturity of source rock through Petrographic Image Analysis (PIA).	Proceedings of First Conference and Exhibition on Strategic Challenges and Paradigm-shift Hydrocarbon Exploration with Special Reference to Frontier Basins, Mussoorie, Sept 2002; Vol.2; pp 121-127
16	<b>Mishra HK</b>	Petrography Image Analysis –A case study for Indian Permian coals	ICCP News No. 28, Mar 2003, P 6-8.
17.	<b>Mishra HK, Mukherjee TK, Singh JP</b>	Petrographic character of coal and lignite of India and their CBM Potentiality.	World Confederation of Productive Science Seminar (India Chapter) 2003; Organized by World Confederation of Productive Science (India Chapter).
18.	<b>Mishra HK, Maitra J, Nath S</b>	Petrography of some Singrauli coals.	Global Coal 2005 - An International Seminar on Coal Science & Technology, Emerging Global Dimension; CFRI New Delhi, pp.449-462.
19.	Imam Z, <b>Mishra HK, Nath S</b>	Characterization of Indian coals using SEM and EDS techniques.	International Workshop on the Application of Nanocrystalline Diamond like Carbon Materials 2006; pp.221-227.
20.	Singh AK, Sahay AN, <b>Mishra HK</b>	Use of LVMC coals in blast furnace coke making to improve availability of Indian coking coals	Asian Mining Congress, Resurgence of Mining in Asia: Prospects and Challenges, Jan 2010, Vol.II; pp 259-268.
21	Singh AK, Sahay AN, <b>Mishra HK</b>	Effective Utilization of beneficiated LVHR coking coal and low rank Indian coals for BF coke making.	Minetech, Jan-March, 2011, Volume 32, page 3-12
22	<b>Mishra H.K</b> and Singh A.K	Coal petrography and beneficiation studies of low volatile high rank coal of Damodar valley basin: Implication for augmentation of coking coal resources	34 <sup>th</sup> International Geological Congress, Brisbane, Australia 5-10 Aug, 2012.



		in India	
23.	<b>Mishra H.K and</b> Chopra,R.K	Utilization of non coking coals for Blast Furnace Coke Making.	Presented paper in the 17 <sup>th</sup> International Coal Preparation Congress(1CPC-2013) ,Istanbul ,Turkey ,1-6, Oct.2013,Proceedings,pp717-721.Edited by Gulhan Ozbayoglu &Ali Ihsan Arol
24	<b>Mishra H.K,</b> Das T.K,Maitra J.J, Imam Z,Saran S and Debnath A.K	Reduction of BF cost through effective utilization of Indian LVHR and low rank coking coals in blend-A petrographic approach	66 <sup>th</sup> Annual Meeting and Symposium of International Committee for Coal &Organic Petrology(ICCP-2014),Sept.20-27,2014 International Symposium on “application of organic Petrography for Power Steel industries-Our preparedness for facing the challenges in coming decades,Abstract volume,53-54.

List of papers published in Conferences /Symposia/ Seminars, etc.:

Sl. #	Name of Authors as they appear in each paper	Title of the Paper	Name of Journal, Volume, Year & Page
1.	<b>Mishra HK.</b>	A comparative study of petrography of the Permian coals of India and Western Australia.	7 <sup>th</sup> International Gondwana Symposium, Sao Paulo,Brazil,1988,271-296
2.	<b>Mishra HK</b>	A comparison of Jharia basin coals of India and Sydney basin coals of Australia.	XII, ICCP ; Buenos Aires, Argentina, Abstract Volume, 1991, pp.22-27.
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7	<b>Mishra HK</b> , Maitra J	Potentiality of low volatile high rank coal of East Bokaro Coalfield for use in steel industry: a petrographic approach.	Seminar Volume - Coal for Steel 1999; IICM Ranchi, pp.9-17.
8	<b>Mishra HK</b> , Maitra J, Samantaray AK, Imam Z, Mukherjee TK.	Characterisation of Indian coal by automated image analysis for coal bed methane exploration.	Geotechnique 2000; National Seminar in Modern Trends in Geoscientific Techniques, CMPDI, Ranchi.
9	<b>Mishra HK</b> , Maitra J, Imam Z, Mukherjee TK, Mishra BN	Characterisation of Indian coal through Petrographic Image Analysis.	National Seminar on Coal Science & Technology - Vision 2020, Apr 2003; Abstract Volumes, CFRI Dhanbad, p.58.
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15.	Mishra HK	Coking coal Projects-Reserves and Properties.	Workshop on Evolving Strategies for Increasing Coking Coals for Coke Making in SAIL 2006; SAIL R&D, Ranchi.
16.	<b>Mishra HK</b>	Coking coal projects, reserves and properties.	Presented in RDCIS/SAIL Oct 2006.
17.	<b>Mishra HK</b>	Petrographic and beneficiation study of high ash coking coals of Jharia Coalfield.	International Conference Coking Coals and Coke Making: Challenges and Opportunities 2009; RDCIS/SAIL, Ranchi.
18.	<b>Mishra HK</b> , Sahay AN, Singh AK	Value addition to LVMC coal-a case study by CMPDI.	Presented in Coal Preparation in India – Issues and Challenges. Coal Preparation Society of India, New Delhi, Sep 2009.
19	<b>Mishra H.K</b> and Singh A.K	Coal petrography and beneficiation studies of low volatile high rank coal of Damodar valley basin: Implication for augmentation of coking coal resources in India	Presented at 34 <sup>th</sup> International Geological Congress, Brisbane, Australia 5-10 Aug, 2012.

## Section M – Books published

### Books and Technical Reports

- (1) Co-author in a book entitled Koyla Ki Gabeshna [Coal Exploration],CMPDI
- (2) Published 28 technical reports of the work carried out in CMPDI.
- (3)Atlas of Petrographic constituents in Permian and Tertiary coals of India

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