



NML news



**A MONTHLY HOUSE BULLETIN OF
NATIONAL METALLURGICAL LABORATORY, JAMSHEDPUR, INDIA.**

Vol. 2

30 JUNE 1988

No. 3



DR. TARAPADA BANERJEE
(9 August, 1907—6 May 1988)

DOWN THE MEMORY LANE

- 1907 TARAPADA BANERJEE, son of Lalit Mohan and Bhuvan Mohini, was born on 9th August at Manikganj, Bangladesh.
- 1929 Obtained his B.Sc. (Hons) in Chemistry ranking FIRST in the examination.
- 1930 Ranked FIRST in M.Sc. in Physical Chemistry.
- 1936 Awarded D.Sc. by Dacca University and was a Faculty Member of the Chemistry Division till 1948.
- 1947 Awarded Ph. D. by London University and made Fellow of the Royal Institute of Chemistry.
- 1948 Joined NML as Assistant Director.
- 1955 Received Cooper Memorial Medal for his work on electrolytic manganese and manganese dioxide.
- 1957 Promoted to Deputy Director at NML.
- 1958 Awarded Dr. K. G. Naik Gold Medal by University of Baroda for his contribution in developing Indian Industries.
- 1966 Became Scientist-in-Charge of the laboratory.
- 1969 Retired on 22nd February.

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FROM THE EDITORS . . .

In the demise of Dr. T. Banerjee, the country has lost an illustrious scientist and the Laboratory, one of its noted founding fathers. We pray that the departed noble soul rest in peace. High standard of research and deep commitment to work was the hall mark of Dr. Banerjee's professional career and should continue to inspire us all in this laboratory.

A newly constituted Research Council (RC) has replaced the erstwhile Research Advisory Council (RAC) and has already swung into action under the Chairmanship of Prof. P. Rama

Rao, Director, D.M.R.L. Hyderabad. As we are all aware, the RC has been conceived to participate in a very meaningful manner with the functioning of the Laboratory and the C.S.I.R. has now vested much larger responsibility with this Council. It is being hoped that while directing, monitoring and evaluating the R&D programmes of the laboratory, the RC would help us fulfil our objective of 'pursuit of excellence in research in the preparation and properties of engineered materials'. It must however be remembered that the achievement of the goal that the Laboratory would set for

itself is primarily dependent on the scientific and supporting staff. It is they who have to critically examine the R&D programmes which are being consolidated for the next decade and also decide their own role in the planning.

NML News have now decided to focus on the highlights of research of a Division in each issue with a view to familiarising one and all with the major research activities. It is fervently hoped that the Divisions would co-operate in this endeavour.

FIRST RESEARCH COUNCIL MEETING

1. Address by
Prof. P. Rama Rao
2. Thrust Area Projects
(On going)
3. Thrust Area Projects
(New Proposals)
4. Sponsored Projects
5. Comments from RC
Members
6. Growing Grass and R&D :
Comments by
Dr. S. Banerjee
7. Presentation of Selected
Results Obtained Recently
 - (a) SiC and Al_2O_3 —
SiC Fibres
($0.2 \times 100 \mu\text{m}$)
 - (b) Why is Pitting Corrosion
Faster in the Weldment
than the virgin steel
 - (c) NML Inhibitor to help
achieve the oil seed
mission
 - (d) A high apparent density,
high compressibility
electrolytic iron powder
from sponge fine
 - (e) Numerical Experiments
invalidate the small scale
yielding assumption

FIRST RESEARCH COUNCIL MEETING

The first meeting of the Research Council (RC) of NML was held on 17th June, 1988 under the Chairmanship of Prof. P. Rama Rao, Director, Defence Metallurgical Research Institute, Hyderabad. The following external members attended the meeting.

Dr. S. K. Gupta, Director, R & D Centre for Iron & Steel, Steel Authority of India Ltd., Ranchi.

Dr. J. J. Irani, President, Tata Iron & Steel Company, Jamshedpur.

Prof. P. K. Rao, Head Metallurgy, Indian Institute of Technology, Bombay.

Prof. H. S. Ray, Indian Institute of Technology, Kharagpur.

Dr. P. N. Chakraborty, Director, National Institute of Foundry & Forge Technology, Ranchi.

The Research Council of NML is an apex body, which advises and recommends the formulation of research programmes of the laboratory, keeping in view the Five Year Plans and national priorities. It reviews the research activities, assesses the progress of research programmes, and suggests the future directions of research. It also advises on fostering linkages between the laboratory and academic institutions, research organisations, industry and potential clients.

Prof. S. Banerjee, Director, NML thanked the chairman and members of the RC and other invitees for sparing time to be present in the RC. He made a presentation on the state of R & D at NML.

In his presentation, Prof. Banerjee pointed out that NML's organisational structure has three basic elements: Divisions, Committees and Groups. The Divisions are hierarchy-based whereas the Groups are function-based and non-hierarchical in nature, and the obvious conflict in the organization of the Divisions and the Groups is resolved through discussions and through the consensus which emerge in the committee meetings.

He stated that NML's twenty three R & D Divisions have been merged to produce seven new divisions and three entirely new divisions have been created: namely Computer Applications, Instrumentation & Electronics and Process & Project Engineering. The committee structure consists of 14 committees within the laboratory, each one of which has a written constitution and the chairman of the committee delegated with executive and financial powers of the Director.

Prof. Banerjee highlighted different types of R & D programmes of NML—viz. Thrust Area Projects (TAP), Sponsored Projects (SP) and Exploratory Projects (EP) and compared these three types of programmes with regard to their basic concepts, duration, scientist—year input, funding, weightage and numbers. He gave a list of the different types of R & D Projects, and outlined the procedure developed at NML in monitoring and evaluating the NML's programme on Exploratory Projects and Sponsored Investigations.

Prof. Banerjee also outlined the (1) Major Achievements in R & D Management, (2) Major Organizational Achievements, (3) Major problems of NML and (4) Major

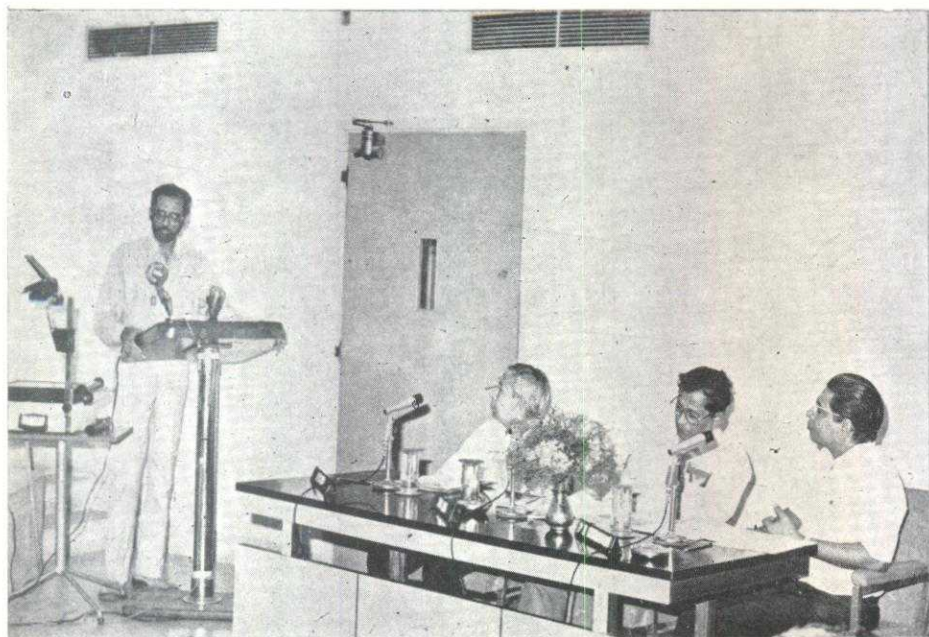
tasks that must be accomplished by NML in the coming two to three years.

ADDRESS BY PROF. P. RAMA RAO, CHAIRMAN, RC.

Prof. P. Rama Rao pointed out that the terms of reference and role of RC are conceived to be different from those of previous Research Advisory Council (RAC) and it is expected now to play a more decisive role in directing, monitoring and evaluating the laboratory's R&D programme. He expressed the hope that at the end of the three years tenure of the present RC, a quantum change would be perceivable in the laboratory's R & D output and sought committed effort of the RC members to help NML achieve the same.

He suggested that a profile of the laboratory's programme in terms of technical and financial input/output and in terms of utilization of R & D results be drawn and presented at the next RC meeting. He advised that the profile of the laboratory should include among other things, statistics on resources deployment in terms of thrust area, sponsored and exploratory projects. He invited the members to send any questions and detailed comments on the programmes presented in the Agenda directly to him with a copy to the Director, NML.

The chairman cautioned against the dissipation of research effort and stressed the need to concentrate efforts once the thrust areas were spelt out. He referred to the 3 'F's pronounced by Bell Laboratory of USA viz. Focus, Funding and Freedom. He said that Indian research is not lacking in funding and freedom. What is lacking is 'Focus', an aspect that merits serious consideration.



Dr. S. Banerjee making his presentation. (Sitting L-R) Prof. P. K. Rao, H. S. Ray and Dr. P. N. Chakraborty.

He also referred to the CSIR directive that 30% of laboratory's budget be earned from sponsored research which might often lead to a compromise on the laboratory's thrust area programmes. However, an apparently conflicting situation such as this might be avoided by integrating the sponsored research activity with that of the thrust area programmes.

Dr. Rao appreciated the linkages established by the laboratory with public and private sectors industry/user/agencies and suggested that such linkages should also be made with universities from whom inputs in basic research could be drawn for the thrust area projects.

DISCUSSIONS ON R & D PROGRAMME

In this session group leaders of the various R & D projects presented reports on the status and progress of each project, such as :

Thrust Area Projects (On going)

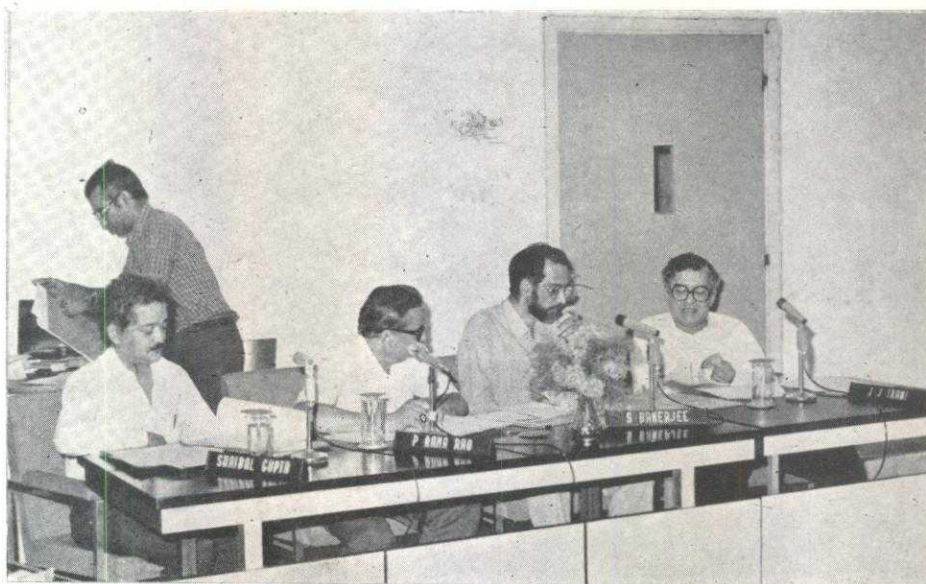
1. Beneficiation & purification of Tungsten Ores of India.
2. Processing of Polymetallic Sea Nodules for the recovery of metallic values.

Thrust Area Projects (New proposals)

3. Production of low phosphorus and low sulphur pig iron through Vertical Retort Direct Reduction-Submerged Arc Furnace (VRDR-SAF).
4. Ferritic steel for elevated temperature applications.
5. Component Integrity Evaluation.

Sponsored Projects

1. Reduction of copper content in dump slag at the Indian Copper Complex, Ghatsila.
2. Development of formulation for transportation of wet sour crude condensate gas.
3. Development of inhibitor for oil/gas well acidization.
4. Protection of process equipment in the production of edible oil from rice bran using inhibitor.
5. Development of superior quality zinc alloys.
6. Evolution of emission standards for foundry industry.
7. Mechanical properties of advanced ceramics.
8. Advanced high strength ferrous alloys.



Research Council Members (L-R) Dr. S. K. Gupta, Prof. P. Rama Rao, Dr. S. Banerjee and Dr. J. J. Irani.

The RC also noted the progress achieved by the laboratory on Exploratory Projects, status of ongoing Sponsored Investigations, Sponsored Investigations completed during April 1987 to March 1988, status of NML-Tata Steel Interactive Projects, status of RDCIS, SAIL — NML Interactive Projects.

COMMENTS FROM THE RC MEMBERS

At this stage, the floor was open to all RC members to express their views and make some suggestions. The chairman in cohesion with other members of the RC felt that for a proper orientation of R & D activities the following initiatives be taken up:

- A perspective plan for the next ten years based on the capabilities of NML and the needs of the country: as also, a statistical profile should be prepared. RC members should help the laboratory to fill up the information gaps in framing a plan relevant to the specific needs of the country since these are not always known, keeping in view nationally identified problem areas.
- Recruitment at senior levels should be made to provide effective support for the programme of work envisaged.
- NML's Research Appraisal & Publications Committee (RAPC) should invite scientists from outside the laboratory to have objective assessment of the proposed and on-going projects.
- Interactive projects between I.I.T. Kharagpur and M.C.R.S. Digha should be initiated.
- Encouragement to Ph.D. work could be given, if it is related

to the Thrust Area Projects of the laboratory.

- A calendar for RC meeting should be drawn and intimated to each member well in advance.

Prof. S. Banerjee, Director, NML in his final remarks agreed to bring out a ten year perspective plan along with the statistical profile as suggested by RC and appreciated the suggestions made by Dr. Irani and Dr. Gupta for participation of RC members in filling up the gaps by giving valuable information regarding the needs of the country. He also felt the acute shortage of expertise and leadership in NML and would put

up a proposal in the next RC for recruitment of a few scientists at 'F' and 'G' and Director's Grade to deal with the situation as suggested by the RC. He also clarified that NML's present R & D programme on TAP, SRP and SI accounts for 75% of NML's organizational effort and happens to be oriented towards the need of the market as expected by RC. However NML's Exploratory Projects which accounted for the rest 25% would serve the long range interest of the laboratory in terms of developing entirely new ideas, innovation and concept and would give full opportunity to develop the initiative and enterprise of an individual bright scientist in NML.

GROWING GRASS AND R&D:

An extract from the comments made by, Prof. Banerjee, during the RC meeting

".....When I joined the laboratory two and half years ago, the first task I gave myself was to dig out the deep rooted weeds which had filled up NML's sprawling lawns in the front, and then plant indigenous lawn grass — called Durba. My target was to produce an uniform velvety green one hundred per cent Durba with no weeds; and with 100% ground coverage.

After repeated, patient and painstaking bouts of redigging, replanting, dweeding, mowing, rolling, levelling, soil conditioning, nutrient feeding and insecticide dispersal, today, I have 100% Durba and no weed in the lawns. But, the velvety green is not uniform, neither is the coverage 100%. The Korean, Nigerian or the Californian variety of grass is genetically programmed to produce a dense 100% coverage and to develop an uniformly green colour. Inducing the indigenous Durba to

behave similarly is a very difficult task.

But Durba is what I must use and not some imported exotic variety; because, it is the Durba which knows how to grow in the local soil and it is the Durba which is conditioned to the temperature and humidity profile prevalent here, and it is the Durba which has learnt to survive the moisture stress and the whole spectrum of pests and disease in the country.

To produce that velvety green, 100% dense packing with Durba, I have yet to learn and achieve how to promote multiple growths, at the nodes of an individual Durba shoot....".

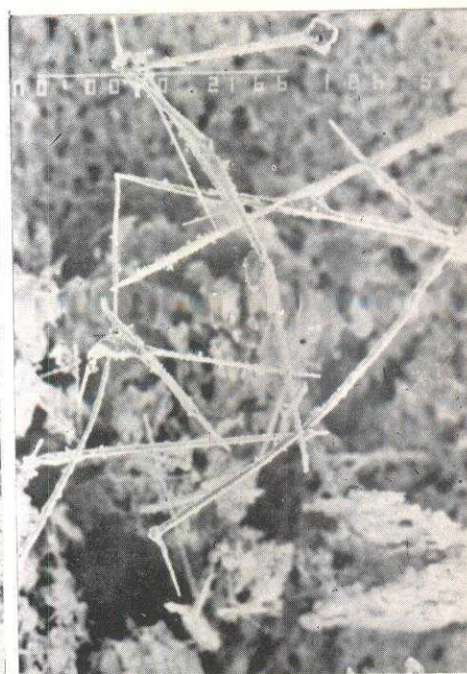
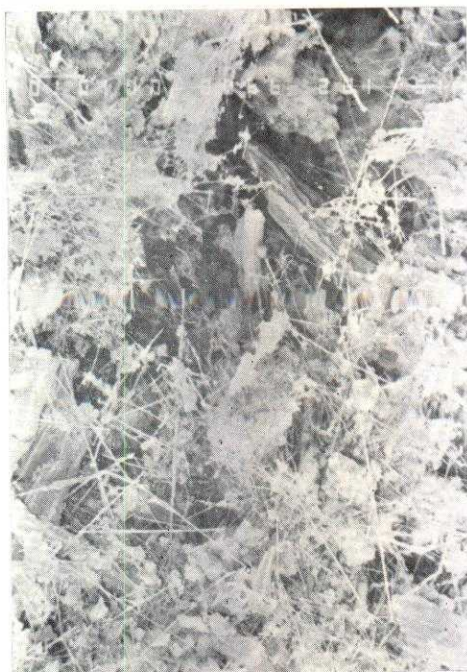
Prof. Banerjee said that he shared this experience on Durba in considerable details since much of his experience in promoting R&D at NML, had been very similar to growing Durba.

PRESENTATION OF SELECTED RESULTS OBTAINED RECENTLY AT NML

Prof. S. Banerjee presented some exciting selected results achieved recently at NML on the following subjects.

1. SiC and Al_2O_3 —SiC Fibres ($0.2 \times 100 \mu m$)

High aspect ratio (upto $120 \mu m$) Silicon Carbide Whiskers/Fibres, have been grown from pyrolysis of Rice Husk. This yields whiskers of diameter 0.2 to $0.5 \mu m$ and lengths of upto $250 \mu m$. The whiskers (approx. 20-30% by volume of the product) are intermixed with fine Silicon Carbide particles, which necessitates separation before possible use of the whiskers in Metal-Matrix-Composites. Another route has also been successfully tried (Patent applied for) where the whisker yield is much more (approx. 80-90%) — makes particulate separation unnecessary.



SiC and Al_2O_3 —SiC Fibres ($0.2 \times 100 \mu m$).

2. WHY IS PITTING CORROSION FASTER IN THE WELDMENT THAN IN THE VIRGIN STEEL ?

The weldment of a structural member virtually becomes a sink for residual flaws and inclusions. Intense localized corrosion con-

touring around such inclusions has been experienced in weldment zones during service conditions, e.g. submerged steel structures in sea water (Off-shore oil well platforms). Studies at NML under simulated and potentiostatically controlled conditions have shown pit growth at the peripheral boundary of the oxide inclusions (Fig. 1). These inclusions act as local cathodic site to stimulate anodic attack at the surrounding matrix. Pits of the order of $30 \mu m$ diameter (SEM Photograph) of the type indicated in category-III of the schematic has been found.

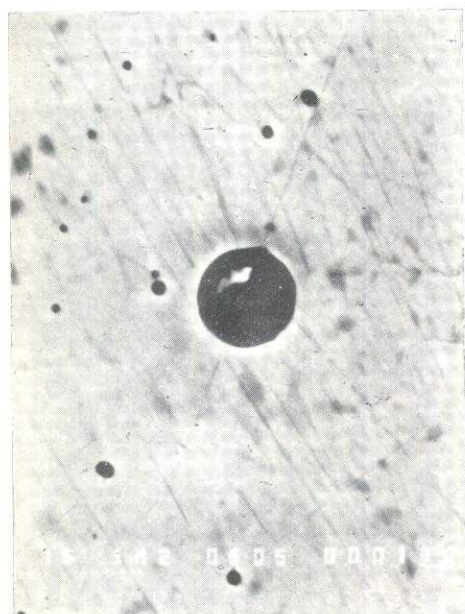


Fig. 1 Pit growth.

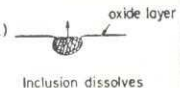
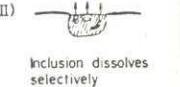
PHENOMENON	MECHANISM	
	Inclusion	Adjacent matrix
I)  Inclusion dissolves	Unstable	Unreactive or protected
II)  Inclusion dissolves selectively	Component phases unstable	Unreactive or protected
III)  Matrix (adjacent) dissolves	Cathodic site	Unstable
IV)  Disbonding at interface	Unreactive in bulk solution but dissolves within the crevice	

FIGURE 2 — Schematic pit nucleation processes.

3. NML INHIBITOR TO HELP ACHIEVE THE OIL SEED MISSION

A Technology Demonstration Plant (TDP) has been set up by Central Food Technological Research Institute, Mysore, to establish the feasibility of technology developed for the production of edible oil from Rice Bran.

NML has been entrusted with the responsibility to study the corrosiveness of stabilized Rice Bran and develop an inhibitor to protect the process equipments in the TDP from attack by HCl stabilized Rice Bran.

Tests carried out at NML under severe plant conditions, simulated the corrosion of mild steel. An inhibitor to prevent the corrosion, under similar set up, was developed at NML.

Conclusions: Weight loss determination shows that NML's inhibitor provides 100% protection. It is highly attractive, less costly and easy to apply.

4. A HIGH APPARENT DENSITY, HIGH COMPRESSIBILITY ELECTROLYTIC IRON POWDER FROM SPONGE FINES

A high apparent density, high compressibility electrolytic iron powder from sponge fines was developed at NML by R. R. Dash, S. K. Singh and R. G. Ganguly, during extensive studies and experimentation with a 5 KgD Iron Powder Production Cell.

It is a combination of dendrites and fragmented dendrites and has an unique microstructure. The

Properties

Physico Chemical

Hydrogen loss	: 0.1%
App. Density	: 3.36 gm/cm ³
Compressibility	: 7.1 gm/cm ³

Screen Analysis %

+100	: Nil
+200	: 20
+300	: 50
-300	: 30

Chemical Analysis%

C (0.01)	Si (0.01)	P: (Trace)
Mn(0.009)	S (0.0038)	Acid insolubles : 0.05

iron powder having high apparent density favours uniform densification of P/M compacts, low shrinkage upon sintering and high die fill. The very high compressibility of the powder enhances the green strength, increases die life and

favours high density parts with reduced pressure.

Trial is underway at ASP Hyderabad to produce rocker support using this powder as the principal ingredient.

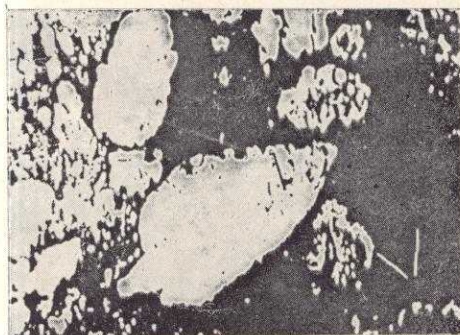
NUMERICAL EXPERIMENTS INVALIDATE THE SMALL SCALE YIELDING ASSUMPTION

Loading of a cracked body is accompanied by plastic deformation in the neighbourhood of the crack tip due to concentration of stress at the tip. If the region of plastic deformation near the crack tip is small, compared to the size of the crack and the remaining uncracked ligament, then the corresponding

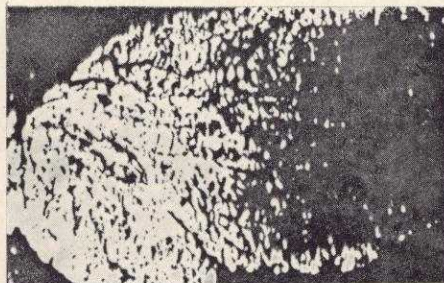
plastic deformation is referred to a small scale yielding.

Linear Elastic Fracture Mechanics based analysis, experiments and applications are founded on small scale yielding assumption, wherein the plastic zone size is independent of crack length or width of the specimen. Numerical experiments using Finite Element Analysis (FE mesh of CT Specimen half is shown in the figure) is carried out on a computer to check this assumption. Accordingly, the plastic zone growth was mapped in CT specimens of varying widths.

The results reported in the graph shows that plastic zone size decreases as width increases. This implies that brittle fracture should more easily occur in large structure. The result also shows that small scale yielding assumption is invalid and accordingly most of the procedures currently used for fracture testing and analysis should be carefully examined and modified.

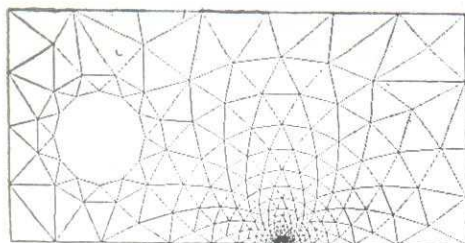


—325 Mesh

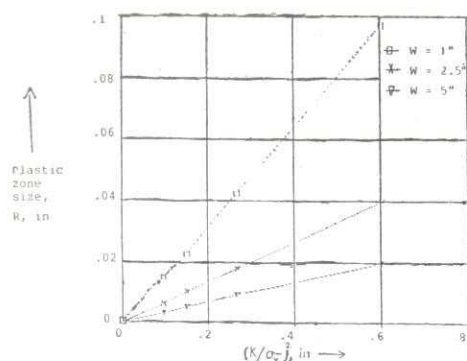


—100+150 Mesh

Microstructure of Processed Powders.



$W = 5''$ $DOF = 694$
Element configuration for CT Specimens.



Plastic zone size in CT Specimens of varying width.



Prof. S. Banerjee releasing the Standard Materials (L-R) Dr. L. P. Pandey, Head, Chemistry Division and Dr. S. Banerjee.

R & D ACTIVITIES

RELEASE OF THREE STANDARD MATERIALS

Prof. S. Banerjee, Director, NML, released the following three Standard Materials on 12th May, 1988 :

1. Nickel steel No. 21.2
2. Low Alloy Steel No. 23.4
3. Low Alloy Steel No. 23.5

The standard reference materials are of vital importance to metallurgical and mineral industries for rapid and accurate analysis of raw materials and finished products. Production of standard samples needs high degree precision work for maintaining homogeneity, proper milling, corrosion protection for preservation and proper packing.

National Bureau of Standards, USA is marketing about 800 standard samples and Bureau of Analysed Samples and N.P.L., U.K. are marketing about 100 standards. In order to achieve self reliance as far as possible NML undertook the project to prepare

standard samples covering the fields of both ferrous and non-ferrous metals, alloys etc. A list of the Standard Reference Materials produced by the laboratory alongwith their composition etc. is given below. These are readily available for sale to the users.

Standard Materials Produced at NML

Sr. No.	Standard Material	Composition (percentage)
1.	Steel (No. 13.3)	C 0.468, Si 0.255, S 0.028, P 0.017, Mn 0.76
2.	Low Carbon Steel (No. 13.8)	C 0.04, Si 0.109, S 0.025, P 0.011, Mn 0.39
3.	Steel (No. 20.01)	C 0.99, Si 0.23, S 0.029, P 0.009, Mn 0.2
4.	Steel (No. 20.02)	C 1.16, Si 0.048, S 0.019, P 0.078, Mn 0.055
5.	Cast Iron (No. 1.6)	Total C 3.30, Graphitic C 2.897, Si 1.987, S 0.030, P 0.219, Mn 1.015

Sl. No.	Standard Material	Composition (percentage)
6.	Iron Ore	Total Iron 60.80, Si 3.49, Alumina 4.52, TiO_2 0.20, P_2O_5 0.13
7.	Ferro Silicon (No. 31.1)	Si 74.22, Al 0.55, Ca 2.020, P 0.026
8.	Ferro Chrome (No. 30.1)	Cr 64.9, C 8.71, Si 1.87
9.	Ferro Vanadium (No. 35.1)	V 52.1
10.	Ferro Molybdenum (No. 32.1)	Mo 63.95, Si 0.97
11.	Ferro Titanium (No. 34.1)	Si 2.55, Ti 24.91, Al 5.54
12.	Si-Aluminium Alloys (No. 51.1)	Si 6.15, Mn 0.195, Cu 0.0295, Fe 0.79
13.	Manganese Ore (No. 66.2)	SiO_2 4.96, Fe 10.045, Mn 47.43, Alumina 1.65, P_2O_5 0.295
14.	Fluorspar (No. 72.1)	SiO_2 1.34, Total Ferric Oxide 0.80, Al 0.84, Calcium Fluoride 95.63, Calcium Carbonate 1.19
15.	H. C. Ferro Manganese (No. 33.2)	C 6.82, Mn 80.8, Si 1.14, P 0.19
16.	L. C. Ferro Manganese (No. 33.1)	C 0.115, Mn 85.48, Si 1.74, P 0.129
17.	Lime Stone (No. 71.1)	SiO_2 0.52, Calcium Oxide 55.1, MgO 0.50, Loss on Ignition 43.48
18.	Alloy Cast Iron (No. 7.3)	Total C 3.07, Graphitic C 2.55, Combined C 0.52, Silicon 1.21, S 0.014, Mn 0.82, Cr 0.38, Ni 1.89, Cu 0.029
19.	Brass 70/30 (No. 42.1)	Cu 58.18, Zn 29.39, Fe 0.07
20.	Brass 60/40	Cu 58.18, Lead 2.56, Zinc 38.99, Fe 0.09, Tin 0.12
21.	Nickel Steel (No. 21.2)	C 0.154, Si 0.287, P 0.046, S 0.035, Mn 0.51, Ni 3.05, Cr 0.84
22.	Low Alloy Steel (No. 23.4)	Si 0.88, Mn 0.39, Cr 5.99, Ni 0.54, Cu 0.33, V 0.69
23.	Low Alloy Steel (23.5)	Si 0.526, Mn 0.34, Cr 4.10, Ni 2.57, Cu 0.497, V 0.44
24.	Ocean Bed-Polymetallic Nodules (No. 2388)	SiO_2 16.07, Fe 14.94, Mn 21.28, Ni 0.71, Co 0.14, Cu 0.49

INTERNATIONAL CONFERENCE ON RAPID SOLIDIFICATION PROCESSING AND TECHNOLOGY

The National Metallurgical Laboratory, jointly with the Indian Institute of Metals, will be organising an International Conference on Rapid Solidification Processing and Technology, at Jamshedpur during 15-17 March, 1989.

Scope of the Conference

The industrial world today is witnessing the emergence of a whole new spectrum of materials produced through rapid solidification. The conference is proposed

essentially to bring the experts in the field together so as to take stock of its status with a view to bridging the gap between laboratory developments and industrial use. Emphasis during the conference would be broadly laid on the following aspects:

1. Characterisation and understanding of structure formation during rapid solidification.
2. R.S. Processing Technology; for bulk microcrystalline and amorphous materials.
3. Shaping and forming of rapidly solidified materials.
4. Engineering application of R.S. products:
 - a) Structural
 - b) Magnetic materials
 - c) Electronics

For further details, address your queries to:

The Conference Secretariate-ICMS-89, C/o Dr. S. C. Sivaramakrishnan, National Metallurgical Laboratory, Jamshedpur 831007, India.

PUBLICATIONS

1. 'Education and training in electroplating and metal finishing in India'—S. K. Narang. Presented at the Workshop on the Status of Electrochemical Education, Science & Technology in India, Bangalore, 16-17 June, 1988.
2. 'Production of Cr-Mn-N-C-W-Mo heat resistant austenitic steel by induction melting process for high temperature application'—K. Prasad and R. Singh, Steel India, Vol. 11, No. 1, 1988.

HONOURS & AWARDS

1. Dr. S. K. Narang was elected the Vice-President of the Electrochemical Society of India, during the Annual Technical Meeting & Workshop organised by the Electrochemical Society of India at Bangalore from 16-17 June, 1988. This honour comes to him for his outstanding contribution in the field of electrochemistry. He was the Chairman of the Technical Session on Metal Finishing also.
2. Dr. S. K. Tiwary Scientist EI, has been selected by the Indian Scientific Translators Association for inclusion in the Directory of Scientific and Technical Translators.

PATENTS FILED

1. 'An improved process for production of contact material by a two layer powder pressing-sintering-infiltration technique' — P. K. De, S. P. Chakraborty, S. K. Chowdhury and R. K. Dubey. It was filed on 30th December, 1987.
2. 'A process for production of Ag/AgCd composite by roll cladding technique'—P. Basak, S. C. Dev and R. K. Dubey. No. 183/DEL/88, dated 10th March, 1988.
3. 'Improved process for making high quality steel directly from fine particles of iron rich materials and non-coking coal fines' — S. Banerjee, K. N. Gupta, S. Prakash. No. 1101/DEL/86, dated 11th March, 1988.

PATENTS ACCEPTED

Indian Patent No. 162297 (927/DEL/84), dated 10th December,

1984. 'A process for the preparation of non-corrosive flux for soft soldering of copper and copper based alloys' — Inder Singh, D. D. N. Singh and M. K. Banerjee.

PATENTS SEALED

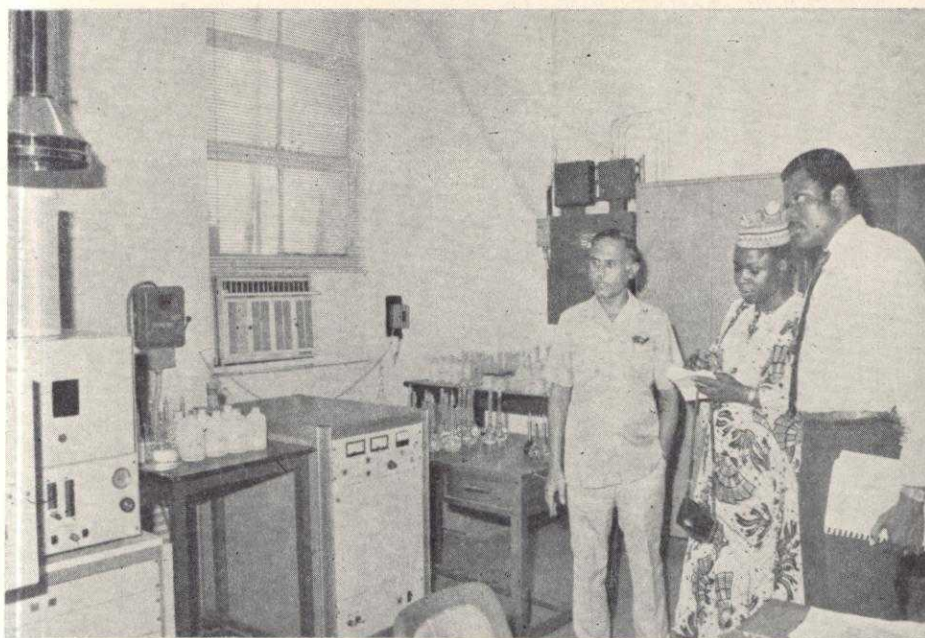
1. Indian Patent No. 158091 (844/DEL/80), dated 25th February, 1982 sealed on 25th September, 1987 — 'An improved process for the production of stainless steel clad aluminium sheets' — J. Bhattacharya, B. N. Ghosh and S. K. Banerjee.
2. Indian Patent No. 159432 (853/DEL/83), dated 22nd December, 1983, sealed on 19th February, 1988 — 'An improved process for sulphation roasting of copper sulphide concentrates to recover copper values in soluble form' — V. A. Altekhar, P. K. Som and S. K. Roy Chowdhury.

LECTURES

1. Shri Kishori Lal, Scientist 'EI' NML. 'Microstructural Inhomogeneity in DC cast Al-Mn billets'. The lecture was jointly organised by NML and Indian Institute of Metals, Jamshedpur Chapter, on 13th May, 1988.
2. Dr. S. K. Narang, Scientist 'EI', NML. 'Iron Electroforming'. The lecture was organised by the Institution of Engineers (India) Jamshedpur Local Centre, on 23rd May, 1988.
3. Dr. A. K. Lahiri, Department of Metallurgy, Indian Institute of Science, Bangalore. — 'Application of simulation, modelling and optimisation techniques to metallurgy and mineral processing' on 24th May, 1988. The lecture was organised by the Seminar Sub-Committee, at NML.



Prof. S. Banerjee explaining NML's R&D to Iranian Delegation.



Nigerian Scientists in the Chemistry Laboratory.

VISITORS

1. Iranian Trade Delegation, consisting of: Mr. M. H. Taghizadeh, Head of Central Laboratory, Mr. N. Mohasseni, Dy. Chief Engineering, Rolling Mills, Mr. Ali Dohali, Sr. Engineer, Transaction Committee, Mr. P. Akhavan, Dy. Head of Refractory Production Plant, Mr. H. S. Fadali, Head of Sintering Plant, Mr. V. P. Shirazi, Sr. Engineer (Stocks & Indent) Mr. Djaffer Moatakef, Head of Ref. R & D and Quality, and Mr. H. Zia, Head of Refrac-
2. A group of 50 students accompanied by 2 Faculty members of Physics and Chemistry Club of Lyola School, Jamshedpur, on 10th May, 1988.
3. Dr. A. K. Lahiri, Prof. Department of Metallurgy, Indian Institute of Science, Bangalore, on 24th May, 1988.
4. Nigerian Scientists, consisting of: Dr. Aderonpe, and Mr. Adiuku Brown, on 17th June, 1988.

tory Maintenance, on 13th May, 1988.

STAFF NEWS

WE WELCOME THEM AND WISH THEM A FRUITFUL STAY AT VML...

Shri G. Sridhar, Scientist 'B'; Shri Ashok Kumar Singh, Pharma-

cist; Shri A. Ramesh, Cost Accounts Clerk; Mrs. R. Jayashree, Receptionist; Shri Mukteswar Maiti, JTA; Shri Biswajit Pan, Cook-cum-Bearer; and Shri M. K. Das Biswas, Assistant (G).

DR. AMITAVA ROY

Dr. Amitava Roy, a Ph. D. from University of Saarland, Saarbruecken, West Germany, has joined the laboratory as Scientist 'EII' on 6th June, 1988. He did his M. Tech. from Indian Institute of Technology, Kanpur in 1973 and stood first. After spending two years for M.S. (1975), at Carnegie-Mellon University, Pittsburgh, U.S.A., he returned to India and served Steel Authority of India, Ranchi for 2 years from Aug. 1978 to Dec. 1980 as Research Engineer.

He again went abroad for his Ph.D. Degree in 1982 and then worked as a Research Associate with Dr. T. K. Trivedi at Ames Laboratory, Iowa State University, U.S.A. for one year and with Prof. S. L. Sass of Cornell University, U.S.A. till 1985.

On his return to India in April, 1985, he joined M/s. Thapar Corporate R & D Centre, at Patiala as Head Material Science Division. Dr. Roy has contributed 10 papers in the areas of Physical metallurgy, Glass Fibre Reinforced Plastics, Solid state transformation in Cu-In System, Directional solidification of Al-Si alloys.

WE CONGRATULATE THEM ON THEIR PROMOTIONS...

Sarvashri D.J.N. Prasad, P. P. Lashminarayan and B. B. Choudhury as Sr. Stenographer;

Sarvashri K. Mohan Rao, B. Sengupta and R. R. Majhi, as Assistant.

Sarvashri C. N. Swamy, and Md. Moinuddin, as UDC,

Shri Peru Hembrum, Record Keeper; Sarvashri Bawa Singh, K. P. Mahato, S. N. Praharaj,

Murari Prasad, as H.A.G., Shri Uddam Singh, as Security Guard, and Shri Shangara Singh, as Daftry to a higher grade of (Rs. 950-1400).

WE WISH THEM A HAPPY RETIRED LIFE...

(Joining date in parenthesis)

Shri S. P. Nandi, Gr.II(4), Shri R.M.D. Nayar, Scientist 'A1' (23-5-1962)

WE FEEL FOR THEM ON THEIR TRANSFER...

Shri S. K. Bose, Scientist 'E11' joined Regional Research Laboratory, Bhopal.

ELECTION OF WELFARE COMMITTEE AT GOLMURI COLONY

At a meeting conducted by the NML Welfare Committee at Gustad Club House, Golmuri, Jamshedpur on 28th May, 1988 the following office bearers were elected.

Shri A. Majumdar, Chairman, Shri T. R. Soni, Vice-Chairman, Shri B. B. Sengupta, Secretary, Shri Sib Nath Prasad, Jt. Secretary.

Sarvashri A. K. Moitra, Surender Kumar, S. Sanyal, S. Bagchi, A. K. Panda, S. K. Biswas, S. K. Banerjee, Nirmal Singh, Afzal Ahmed, A. C. Dhar, P. C. Paul, Darshan Prasad, P. V. Appa Rao, Rama Nand Prasad, B. Toppa, Vijay Bahadur Singh, M. B. Giri, K. P. Singh and Som Nath Kar, as members.

SOCIAL & CULTURAL ACTIVITIES

INAUGURATION OF DISPENSARIES AT AGRICO FLATS AND TUILADUNGRI COLONY

NML Dispensaries at Agrico Flats and Tuiladungri Colony were formally opened on 17th June, 1988.

Dr. P. Rama Rao, Chairman, Research Council of NML performed the opening ceremony at NML Flats, Agrico, while Prof. S. Banerjee, Director, performed the opening ceremony at NML Colony, Tuiladungri. The shifting of these dispensaries in the new premises, have fulfilled a long outstanding need for providing proper medical

care to the NML Staff and their families.

NML STAFF CLUB ACTIVITIES

The following persons were elected as office bearers of the Executive Committee of NML Staff Club for the year 1988-89.

Dr. A. K. Vaish, Vice-President, Shri B. V. Rama Rao, Gen. Secretary, Shri S. K. Banerjee, Joint Secretary, Shri S. Vaidyanathan, Social Secretary, Shri J. P. Mukherjee, Indoor Secretary, Shri Jang Bahadur Singh, Out-door Secretary, Shri B. N. Das, Treasurer.

Inauguration of NML Dispensary at NML Flats Agrico, by Prof. P. Rama Rao, Mr. K. N. Gupta, Deputy Director on the left side.

