NEWSLETTER
THE INDIAN INSTITUTE OF METALS
(DELHI CHAPTER)

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Chairman, Delhi Chapter

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Issue No. 34/2010 **Vol. XXXIV "Monthly"** **Date: 26.06.2010**

INTRODUCTION

This News Letter is containing briefs on first Executive Committee Meeting for the year 2010-11.

The News Letter contains the following Technical Write-ups:

1. "Metallurgical Principles in Secondary Steel Making " by Shri S C Suri, Life Fellow IIM and Chairman, Technical & Publication Committee
2. "Carbon Footprint" by Shri K. L. Mehrotra, Ex. CMD, Manganese Ore India Ltd., Nagpur & Vice Chairman, IIM-DC.
3. "HRTEM, STEM and EELS: Advance Techniques for Materials Characterization" by Dr. A. K. Srivastava, Scientist, NPL, New Delhi and Member, IIM DC.
4. Participation in the 2010 International Conference of The Minerals, Metals and Materials Society (TMS 2010), USA by Dr. (Mrs.) Malti Goel, Member IIM DC.

The News Letter also contains National and International news relating to Ferrous and Non Ferrous sector.

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Chapter News

Executive Committee Meeting

The first E C Meeting of the year 2010-11 was held on 29th May 2010 in the office of IIM Delhi Chapter. The name of Shri L Pugazhenthy and Mr. J. Mazumdar were decided for the advisory committee to the EC. The name of the third member is yet to be decided.

The technical and publication committee was formed under the chairmanship of Shri S C Suri with S/Shri G. I. S. Chauha, R. K. Vijayvargia, D. K. Likhi, Dr. A. K. Srivastava, Neeraj Gupta, Manoranjan Ram and Dr. (Mrs.) Malti Goel as memebrs of this committee. The formation of various other committess is in progress.

Various suggestions were received and deliberated by members such as more technical activities, plant visits and technical talks. It was also suggested that Delhi Chapter may invite neighbourhood chapters for parcipating in such activities.

Metallurgical Principles in Secondary Steel Making

S C Suri
Life Fellow, IIM & Chairman
Technical & Publication Committee

1.0 Introduction

Steel quality demands are becoming increasingly stringent. These demands are beyond the normal steel making operations. This requirement is true for specialty steel products. This has resulted in the advent of various secondary steel making processes.

Primary steel making is employed in the steel making furnace. Further refining and control and alloy additions are undertaken in the secondary steel making processes.

The paper reviews the principles of various secondary steel making processes being employed for production of specialty steels which require very stringent quality parameters.

2.0 Secondary Steel Making Processes

Historically Vacuum Degassing (VD) process came in the decades of 1950-60. The initial objective was to lower hydrogen content of liquid steel in order to prevent cracks in large forging quality ingots. Later on the objective also included lowering of nitrogen and oxygen contents.

Purging with inert gas (Argon or Nitrogen) in the ladle using porus plug came subsequently. Its primary objective was stirring with consequent homogenization of temperature and composition of the melt. It offered the advantage of floating of oxide inclusions resulting in cleaner steels.

It is possible to lower carbon content to a very low value in stainless steel by treatment of the melt with oxygen under vacuum or along with Argon stream.

This led to development of process such as vacuum oxygen decarburization (VOD) and Argon Oxygen Decarburization (AOD).

Synthetic slag treatment and powder injection process of molten steel in ladle were started in late 60's and early 70's with the objective of controlling sulphur content of steel

to a low level that are demanded for many applications.

This led to the development of what is known as Injection Metallurgy. Injection of powders of calcium bearing reagents typically calcium silicide was also found to prevent nozzle clogging by Al_2O_3.

In traditional pit side practice without ladle metallurgical operations, the temperature drop of molten steel from furnace to mould is around 20-30 Degree Centigrade. An additional temperature drop of 20-40 degree centigrade occurs during ladle transfer and teeming.

Continuous casting uses pouring of liquid steel through tundish causing further drop of 10-20 degree centigrade. Therefore provision for heating and temperature adjustment during secondary steel making are very desirable. This has led to development of special furnaces such as Vacuum Arc Degassing (VAD) Ladle Furnace (LF) and ASEA-SKF Ladle furnace. These are very versatile units capable of performing vacuum operations.

3.0 Capability of various Secondary Steel Making Processes

The table given below summarizes the capabilities of various secondary metallurgy steelmaking processes.

Various Secondary Steel Making Process and their Capabilities:

	VD	VOD	IGP	IM	VAD	LF	ASEA-SKF
Desulphurization	Minor	Minor	Minor	Yes	Yes	Yes	Yes
Deoxidation	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Decarburization	Minor	Yes*	No	No	No	No	No
Heating	No	Yes	No	No	Yes	Yes	Yes
Alloying	Minor	Yes	Minor	Minor	Yes	Yes	Yes
Degassing	Yes	Yes	No	No	Yes	No	Yes
Homogenization	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Achieving more Cleanliness	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Inclusion Modification	No	No	Minor	Yes	Yes	Yes	yes

* Chemical heating only

Ref: Principles of secondary steel making by Dr. A K Ghosh, IIT, Kanpur

Abbreviation:

VD: Vacuum Degassing
VOD: Vacuum Oxygen Decarburization
IGP: Inert Gas Purging
IM: Injection Metallurgy
VAD: Vacuum Arc Degassing
LF: Ladle Furnace

ASEA-SKF:

As can be seen from the above table the adoption of a particular secondary metallurgy process will depend on the quality parameters and quality stipulations required or laid down by the customer with respect to various quality levels viz sulphur levels, deoxidation levels, carbon levels, alloying levels, homogeneity levels, inclusion levels etc.

4.0 Conclusions

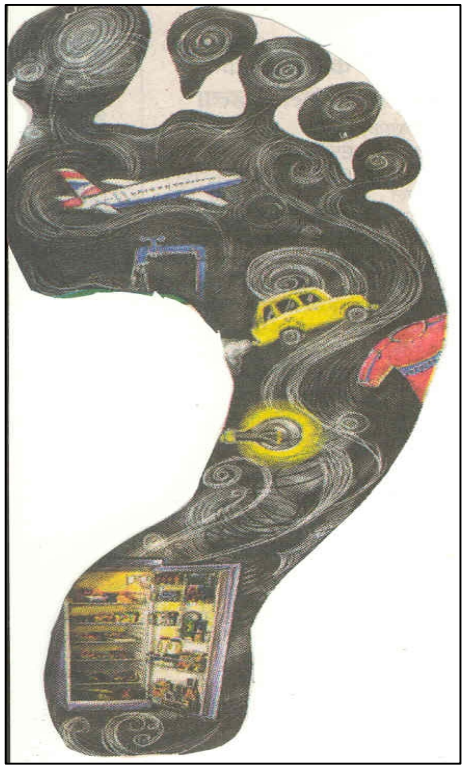
With the increasing requirement of stringent quality stipulations and increasing demand of specialty steels, primary steel making in the furnace and secondary steel making in the ladle have become a distinct feature of specialty steel production. Alloy and specialty steel producers now invariably have the secondary steel making facilities for production of quality grades meeting stringent quality demands.

CARBON FOOTPRINT

K.L. Mehrotra
EX.CMD
Manganese Ore (India) Limited Nagpur
Vice Chairman, IIM-DC

How Climate Change Affects the Universe?

- Climate change is now with us. A decade ago, it was conjecture, today it is reality and the future is unfolding before our eyes.
- Global warming could cause more hunger in Afro-Asian countries and could melt most of the Himalayan Glaciers by 2030 - according to a UN Report.
- Hundreds of millions of people would be affected. The report also predicts more heat waves in countries such as US and EU countries, Canada etc.
- If the current global warming rates are maintained, Himalayan Glaciers could decay at very rapid rates shrinking from the present 500000 Sq. Kms. to 100000 Sq. Kms. by 2030.
- This would reduce water supplies for farming and lead to severe drought situation.
- Temperatures are set to rise by 2~3^{o}C between 2004-2030 causing displacement of over 350 million people due to floods.
- Malarial infection would affect over 400 million people due to flood. Extinction of 25-30% of all the land species. About 265 million people were affected by natural calamities during 2000-2004, out of these 98% were in developing nations.



- Himalayan Glaciers called the "Water Tower of Asia" has a glacier coverage of 5,00,000 Sq. Kms.
- It provides 8.6 billion M^3 of water. About 70% of the world's fresh water is frozen in glaciers. Himalayan Glaciers are the largest store of water outside the polar ice caps and feed seven great Asian rivers viz. Indus, Brahmaputra, Mekong, Salween, Yargtze, Huang Ho and hundreds of small rivers. Nearly 70% of the discharge into Gangas is from rivers in Nepal which means that if Himalayan glaciers dry up so will the Ganga down stream in India.
- Thus by 2020, over 1.2 billion people in Asia will experience increased water stress and over

2.0 billion by 2030. The per capita water availability in India would drop from 1900 M^3 to 1000 M^3 by 2025.

- Cereal yield in Asia could drop by upto 30% by 2050 causing hunger.
- Even modest rise in sea level will cause flooding and economic disruptions in densely populated areas.
- Cholera/Malaria could increase, thanks to flooding and wider habitat range for mosquitoes.
- Some 30% Asian coral reef which sustain a large percentage of marine life are expected to be lost in next 30 years due to climatic changes.

GREEN HOUSE GASES (GHG) - A major culprit.

S.No.	Country	CO_2 Emission (In million Tonnes)	Growth 1990-2004 %	CO_2 Emission Per capita (T)
1	US	6046	25	20.6
2	China	5007	109	3.80
3	Russia	1524	-23	10.6
4	**India**	**1324**	**97**	**1.2**
5	Japan	1257	17	9.9
6	Germany	808	-18	9.8
7	Canada	639	54	20.0
8	UK	587	1	9.8
9	Korea	465	93	9.7
10	Italy	450	15	7.8
WORLD		**28,983**	**28**	**4.5**

- The environmentalists say that the fastest growing contributor to global warming is aviation sector.
- In 2006, all around the world, people took more than two billion journeys on scheduled airlines, which is higher by 4% over 2005. As per ICAO, IATA predicts 50 billion journeys would be performed by 2010.
- As the airplane travels at high altitude the impact on global warming is more. The average plane releases close to one tonne of CO_2 for each passenger, it covers from London to New York or Delhi to London. The logic being that since the emission of CO_2 in huge amount and at such high altitude will have a direct impact on GHG effect leading to increase in global warming.
- Flights are something that people should try to avoid for short distances or unless there is an emergency.
- The authorities instead of promoting aviation in a big way should focus on developing other modes of transports like road and electric trains/metro which are much cleaner and more environmental friendly.
- Every activity we do generates a certain amount of Green House Gases (GHG), which can be measured in units of CO_2 and that is what Carbon Credit is all about.
- In India average Indian emits 1.3 tonnes of CO_2 and with increasing lifestyle it may go up to 1.8 tonnes CO_2 / year. While an American emits 23 T of CO_2, a British emits 11.0 T and a Chinese, 3.1 T, Brazil – 4.1 T/year, Japan 10.6 T/year, Germany 12.3 T, France 8.6 TPY and Russia 13.4 TPY.

- In India, the population who earns Rs. 30,000/- per month emits 5.0 TPY, between Rs.15000-30000/- - 3.1 TPY and below Rs.5000/- per month is 1.0 TPY.
- If the fridge is placed away from heat / Sun, 150 Kg. of CO_2 /year can be reduced more so ever, energy efficient and CFL free fridge is very essential to use.
- While shopping, usage of reusable bag rather than plastic / PP bags can prevent 8 Kg per year of CO_2 emission.
- While brushing the teeth, if the habit of keeping the water tap open throughout, is stopped 3 Kgs. CO_2 / year emission can be reduced.
- 55% of world carbon emission is produced by 15% of population in US, Canada, EU countries etc.
- There are three basic things which one can make a beginning.
  1. Reduction in usage of the planet, which we inhabit.
  2. Reusing of the items we use in daily life.
  3. Recycling of items, which may produce certain byproducts, viz paper recycling, aluminium can recycling, pet recycling and metal scrap recycling.
- If one would like to see the size of his / her Carbon Foot Print in other words, how much tonnage of CO_2 is emitted through their life style every month / year. Let's make a beginning.
- Reduce electricity consumption and switch to CFL bulbs in houses / offices in place of incandescent bulbs / tubelights. This helps to save ½ a ton of CO_2 in a year. 10,000 MW power/per year would be saved if energy efficient CFL's were used to light up homes in India.
- Reduce a Petrol / Diesel by using fuel efficient car with higher mileage say 16 Kms/Ltr., which would emit 40 T of CO_2 in its lifetime say 10 years (4 T CO_2 /year). We may also use Biodiesel / biofuel, admixture to reduce CO_2 emissions. 660 Kg of carbon emission can be reduced if fuel is improved in car/bus engines etc.
- Do not take print out, unless need arises and be conservative in use of paper. 24 grown up trees are required to be cut to produce 1 ton of paper, which has a direct impact on absorbing CO_2. One big tree absorbs 20 Kgs. of CO_2 / year.
- Reduce Air journey. Do it only in if it is unavoidable. Aircraft emits 12.5 kg of CO_2 / per person/100 Kms. all journey at high altitude. Thus a return journey Delhi/Mumbai or Delhi / Kolkata emits 0.33 T of CO_2 per person.
- As well said, **for any climate change entire humanity is involved and all of us are concerned**. The GHG / CO_2 emission can be attributed in two ways. Direct emission of CO_2 is due to usage of car / scooter, heavy vehicles, airplanes etc. Indirect CO_2 emissions is like electricity through coal fired thermal plant, which we use, cooking gas, water supply, eating habits, shopping, etc.

CARBON TRADING: Money from CLEAN AIR

What's Carbon Trading?

- The idea of a trade in Certified Emission Reduction of CO_2 (CER) took place after signing of ***KYOTO PROTOCOL*** of UN Framework Convention of Climate Change (UNFCC).
- It mandates GHG emission caps on industrialized developed nations which have ratified it

but also allows them to buy greener nations GHG emission levels, which means a CER can be earned by reducing emissions through eco-friendly projects. Thus a developed nation can buy a CER from a developing country that doesn't face a cap.

- India/China are the sellers under CDM (Clean Development Mechanism) protocol. CDM allows company projects in developing countries to trade in CERs with countries that have a cap. One CER is equivalent to a reduction of one tonne of CO_2.
- Clean money for dirty air, that's the promise of an emerging trade in Carbon Credit.
- The value of Carbon Trading was around US 30 billion in 2006 as per the estimate of International Emission Trading Association.
- Till Nov. 2007, 288 CDM projects have been registered in India out of 839 CDM projects registered with UNFCC, giving a global share of 33%.
- The CER is sold at a price negotiated between buyer and seller. Currently, Indian sellers are able to realize 12-15 Euros on an average per CER.
- Hence, the CER is offered with a guarantee of delivery by the regulator. Since its launch, in April, 2005, the EU's contract has been close to 1.3 billion tonne CO_2 (CER) traded with a market value of 24 billion euros.
- Therefore carbon credits bought by a Company are a tradable permit that provides a way to reduce GHG emissions by giving them a monetary value. A credit gives the owner the right to emit one ton of CO_2.
- Typically companies that invest in windmill, bio-diesel, co-generation etc., are the ones that can generate Carbon Credits for selling to the developed nations.
- Barely a day goes by without talk of climate change, the scientific report have shown, it is happening and that human activity is responsible. If we are to move beyond talk, we need urgent solutions. The renewable energy, carbon capture and bio-fuels are among the main source to mitigate climate change.

HRTEM, STEM and EELS: advance techniques for materials characterization

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Scientist, Electron Microscopy, Division of Materials Characterization
Centre for Nanoscale Science, National Physical Laboratory, New Delhi

Analytical techniques capable of characterizing the nanostructure of materials are critical for continued growth in nano- science and devices. These techniques are highly sophisticated, sensitive and accurate for carrying out detailed investigations of the materials in terms of their crystallographic structure, lattice imaging, phase identification, variety of defects, particle size and shape analysis etc. Among these, electron microscopy (SEM, TEM, HRTEM, STEM) has made significant advancement in the last seven decades in realizing both theory and instrumentation and has become an indispensable tool in nanomaterials characterization even at sub-nanoscale. Under a defined set of working specifications, the efficiency of the microscope is determined by the accelerating voltage, magnification and its resolving power. Electron microscopy equipped with spectroscopic measurements like energy dispersive spectroscopy (EDS) and electron energy loss spectroscopy (EELS) are beneficial in analyzing inclusions, dopants and their chemical mapping. The coupled mode of image-spectrum has been realized as a powerful tool for determining structure – property correlation at interfaces and grain

boundaries, local stoichiometry, impurity segregation and electronic structure pertaining to atomic states and refined electronic energy shells. Here, we demonstrate several aspects of these analytical techniques in dealing with various types of nanostructured materials including semi-conducting oxides, thin films, nanowires, different structures of nanoclusters, and cross-sectional high resolution imaging and chemistry of materials.

In a conventional transmission electron microscope (TEM), a thin specimen interacts with an electron beam of uniform current density. The acceleration voltage of routine instrument is 100 kV to 200 kV to provide better transmission and resolution and in High Voltage Electron Microscopy (HVEM), the acceleration voltage can be used up to 500kV-3MV. Inside the column of the microscope, electrons are emitted in the electron gun by thermionic, schokkty or field emission. Field emission gun (FEG) is used when high gun brightness and coherence are needed. Electrons interact strongly with atoms by elastic and inelastic scattering. The specimen must therefore be very thin, typically of the order of 5 to100 nm, depending on the density and elemental composition of the object and the resolution desired. The effort for the last few years to increase resolution have been concentrated on using a field emission gun to reduce the energy spread ΔE from1 to 2 eV of the thermionic gun to 0.3 to 0.6 eV with FEG and thus the resolution can be improved. Specimen preparation techniques like; electropolishing and ion beam etching in materials science and ultramicrotomy of stained and embedded tissues or cryofixation in the bio tissues, are another important aspects in the field of TEM and associated techniques while preparing the variety of specimens.

The significance of High Resolution Transmission Electron Microscopy (HRTEM) is that it provides high resolution images that contain information up to 0.1 to 0.2 nm and also operates with small electron probes in various microanalytical modes with a spatial resolution of 0.2 to 100 nm. The acceleration voltage normally employed to operate HRTEM works between 200 kV to 300 kV. HRTEM is extremely useful to study and interpret the crystal structures, phase identifications, phase transformations, epitaxial growth, lattice imaging, crystallization, particle shape, particle size, surface finish, interface structures, defects, dislocations, voids, twins, stacking faults, inclusions, precipitates and more recently several parameters pertaining to nanostructured materials.

Moreover the TEM/HRTEM with Scanning Transmission Electron Microscope (STEM) mode has an advantage that in the STEM instrument, the contrast can be enhanced by collecting several signals simultaneously and displaying differences and/or ratios of these by analog or digital processing. In particular, single atoms on a thin substrate can be imaged with a higher contrast than in the conventional TEM bright-or-dark field modes. An incoherent dark field mode allows a high resolution image of the crystal lattice to be formed, the contrast increases with increasing atomic number. The irradiation of the specimen area can be reduced to a minimum in order to decrease radiation damage. In brief, the principle of high resolution TEM (HRTEM) and scanning transmission electron microscope (STEM) can be explained on the basis that in phase contrast imaging (HRTRM), a parallel beam irradiates the specimen, and the image is formed by interference between many beams (i.e. direct and diffracted beams). In other case, in atomic number Z – contrast imaging process (STEM), a finely - focused beam with convergent angel of nearly 10 mrad. is used for atomic resolution Z- contrast imaging. High Angle Annular Dark Field (HAADF) STEM images are formed by rastering the probe at specimen surface while the intensity of elastically scattered electrons at large angles is sequentially measured by a couple of annular scintillators. Such images are called dark field images since only scattered electrons contribute to the contrast of the image. The intensity detected is proportional to (a) number of analyzed atoms and (b) fractional power of the atomic number of given atoms.

Apart from EDS/WDS as attachment to main SEM and TEM as microanalysis tool, it is significant to

highlight the importance of Electron Energy Loss – Spectroscopy (EELS) as an attachment with TEM and/or STEM. The basics of electron energy – loss spectroscopy (EELS) are understood as a standard method in analyzing the nano-structural observations at a very high precision. A typical EELS spectrum consists of three main energy range, viz. (i) the smallest energy losses that are typically of the order of 1-100 meV, arises from the excitation of phonons. As the resolution of a typical energy filter is about 1 eV, such losses may not be resolved in a microscope and are therefore included in the zero – loss peak in which the electrons appear to be scattered elastically, (ii) at intermediate energies (typically 1 to 50 eV) the energy losses are the primarily to a complicated mixture of single electron excitations and collective excitations (plasmons). The

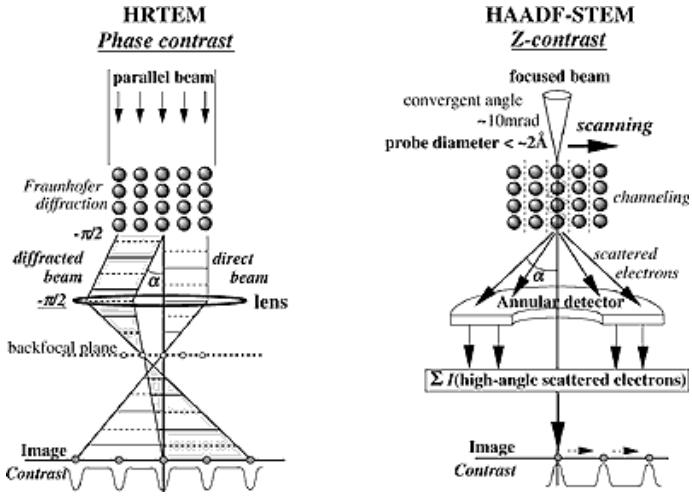

Fig.1: Imaging principles of atomic-resolution phase-contrast and Z-contrast transmission electron microscopy [E. Abe and A.P. Tsai, Tsukuba, Japan]

positions of the single electron excitation peaks are related to the joint density of states between the conduction and valence bands, whereas the energy required for the excitation of bulk plasmons depends mainly on the electron density in the solid. Plasmons may also be localized at surfaces or interfaces and (iii) at higher energies, typically a few hundred eV, edges can be seen in the spectrum, indicating the onset of excitation from the various inner atomic shells to the conduction band. The edges are characteristics of particular elements and their energy and height can be used for elemental analysis. The EELS technique has been realized as a powerful tool for determining structure – property relationships at interfaces and grain boundaries, local stoichiometry, impurity segregation, and electronic structure pertaining to atomic states and refined electronic energy shells.

In the following sections a brief description on the utility and importance of HRTEM, STEM and EELS has been elucidated by a set of examples on variety of materials.

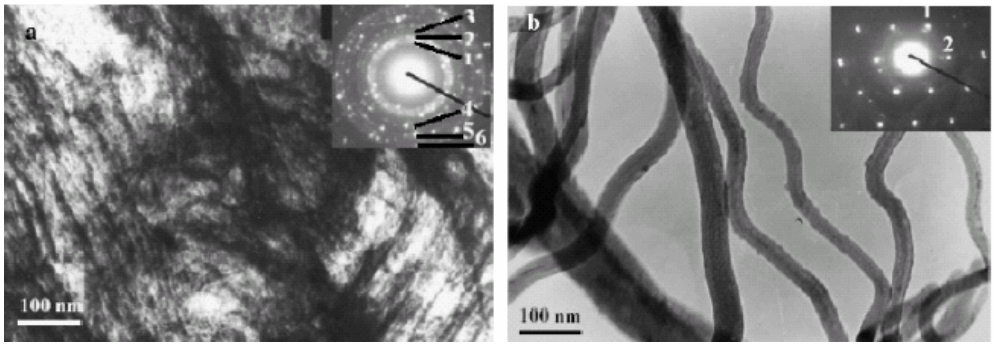

Fig.2: TEM images of ZnO showing (a) thin film and (b) nanowires. Insets show corresponding ZnO-hexagonal crystalline structure [Srivastava et.al. J.Nanosci. Nanotech. 2007]

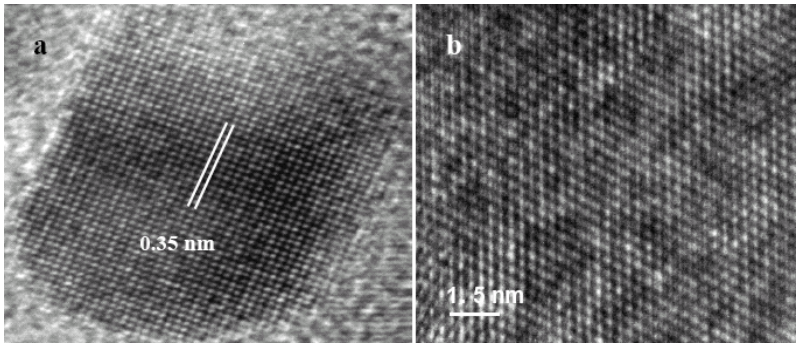

Fig.3: HRTEM images showing (a) oriented TiO_2 grain with interplanar spacings of 0.35 nm, and (b) preferred growth along c-axis of hexagonal-ZnO [Gakhar 2009, Srivastava et.al. Optical Mater. 2009]

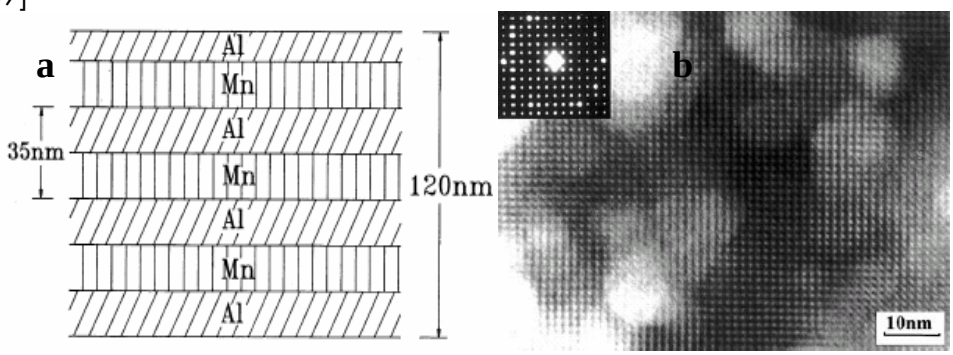

Fig.4: (a) a schematic of the cross sectional view of the composite multilayer thin films of Al and Mn, and (b) HRTEM image of the δ-AlMn phase showing a perfect periodic structure obtained after heat treatment at 823 K for 2h. Inset shows the corresponding electron diffraction pattern along the [001] zone axis [Srivastava et.al. J.Mater.Sci.2007]

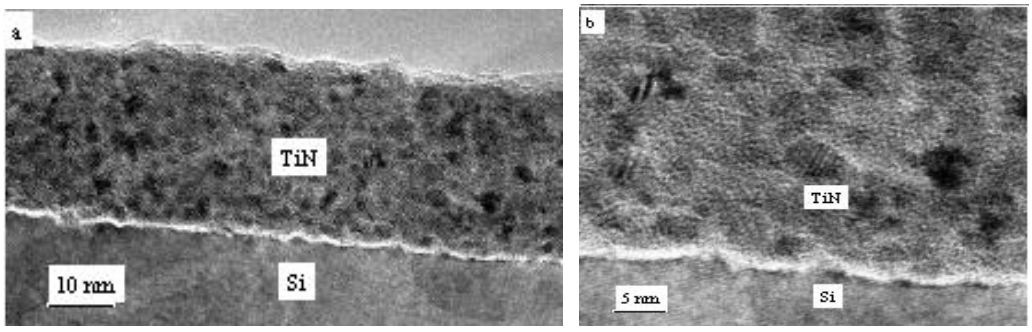

Fig.5: Cross sectional HRTEM images of the TiN film grown by the deposition of (Ti,N) preformed clusters with 2600 atoms per cluster accelerated with an energy of 8 eV per atom, on a Si substrate, showing : (a) the film thickness about 50 nm; (b) the presence of nanograins of TiN [Srivastava et.al. EMSI-2004]

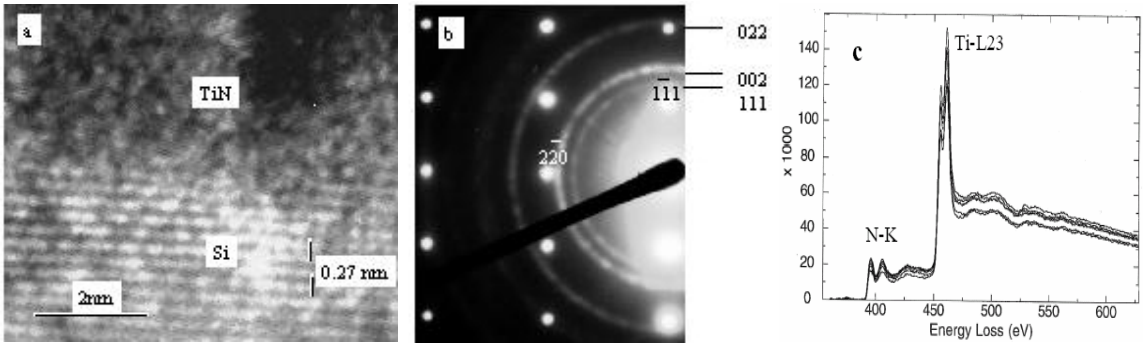

Fig.6: (a) HRTEM image of the interface between TiN and Si; (b) a corresponding SADP recorded

at the apex of the interface, showing the ring pattern of the TiN nanocrystals and the spot pattern of the Si single crystal (sample preparation conditions: 2600 atoms per cluster accelerated with an energy of 8 eV per atom) and (c) EELS spectra (N-K and Ti-L23 edges) over the TiNx thin foil [Srivastava et.al. EMSI-2004]

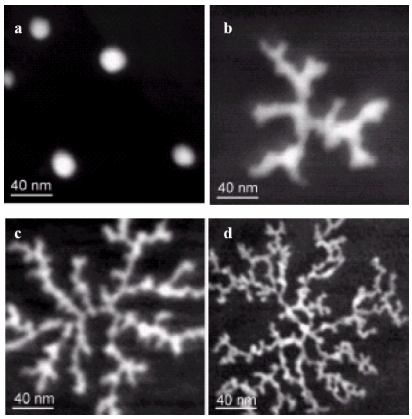

Fig.7: STEM images showing nano-scaled growth morphologies of Sb nanoclusters on graphite surfaces for different sizes of islands clusters (a) <n> = 4, (b) <n> = 90, (c) <n>= 150 and (d) <n> = 500 [Carlier et.al. Nanoletters 2006]

The techniques of HRTEM, STEM and EELS have been discussed and it has been demonstrated that how the precise measurements even up to a subnano – scale can be carried out by measuring the different microstructural features during the interaction of incident electron beam and the local area of the specimen under an electron microscope. Various examples have been drawn from the different nanostructures of TiO_2, ZnO, TiN/Si interface and Sb-nanoclusters to understand the structure and chemistry of the material. The importance and accuracy associated with the measurements even at nano-dimension has been realized and therefore the HRTEM associated with precise analytical techniques has become a powerful probe as a characterization tool in the field of nanoscience and technology. It is important to mention that a literature survey was conducted to compile the above presentation and some of those references may be given to the interested persons if required.

Participation in the 2010 International Conference of The Minerals, Metals and Materials Society (TMS 2010), USA

Dr. (Mrs.) Malti Goel
Former Advisor, Dept. of Science & Technology
Member, IIM DC

Dr. (Mrs.) Malti Goel, Member IIM (Former Advisor, Department of Science & Technology, Govt. of India) presented an invited paper on Strategic Approaches for CO_2 Reduction Rate from Fossil Fuel Use in Steel Industry in The Minerals, Metals and Materials Society (TMS), Seattle USA. Important areas of strategic plan that Need to be pursued for managing CO_2 emissions in steel energy sector in India were discussed. TMS every year holds international conference covering large number of themes concerning Materials Science and Metallurgy. Its 139th Annual Meeting & Exhibition held during February 14-18, 2010 on the theme 'Going for

the Gold in Materials Technology'. Since 2008, TMS has started to hold a Technical Session on the theme Carbon Management. From India it was an honor to be invited to the same. For TMS2011 conference participation and submission of abstracts is due and those interested in receiving the information can send mail to mlg@nic.in co-chair TMS Energy Committee or contact the IIM Secretariat.

News about Members

Mr. Vipin Jain, Scientist-EI at Division of Engineering Materials, National Physical Laboratory, CSIR, New Delhi; has been awarded ***Fulbright-Nehru Doctoral and Professional Research Fellowship for 2010-11*** from ***United States-India Educational Foundation (USIEF)***. Under this Fellowship, Mr. Jain has been visiting *Missouri University of Science & Technology*, Rolla, USA. Mr. Jain received *B.E.* in Metallurgical Engi neering from University of Rajasthan, Jaipur (in 1994) and *M. Tech.* from IITK-Kanpur (in 1996). Currently, he has been pursuing *Ph.D.* at Deptt. of Materials & Metallurgical Engineering, IIT-K, Kanpur. He has acquired professional research experience at different R&D institutions in India, *e.g.*; Electrical R&D Association, Vadodara (1996-1999); ARC International, Hyderabad (1999-2004) and National Physical Laboratory, New Delhi (since 2004). He has also contributed to the IIM as *Joint Treasurer*, Executive Committee-IIM Delhi Chapter (2009-10); *Member,* Executive Committee-IIM Hyderabad Chapter (2003-04) and Officer-In-Charge of Hyderabad Chapter for AMIIM Examinations-2003.

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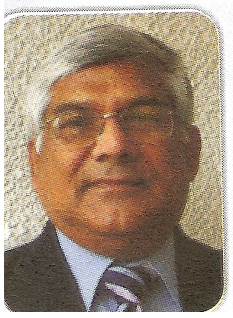

Dr. Sanak Mishra, President of IIM and CEO, ArcelorMittal India Ltd. Has received the distinguished merit award from the department of Materials Science and Engineering of the University of Illinois at Urbana-Champaign, USA on 23rd April 2010. The citation read as follows:

Sanak Mishra (MS Met '70, PhD Met '73) carried out his graduate studies with Prof. Paul Beck. He is presently the Chief Executive Officer of the India Greenfield Projects of ArcelorMittal, the world's largest steel company. He is the President of the Indian Institute of Metals, India's premier professional organization of Metallurgists and Materials Scientists engaged in industry, research and academia.

Dr. Mishra is well known as the architect of the "SAMSKAR" concept, which is a unique code of leadership practice. He designed and implemented it when he was handed over the charge of the then heavily loss-making Rourkela Steel Plant, as its Managing Director, and brought about a dramatic transformation and a remarkable financial turnaround. He was a Member of the Board of Directors of the Steel Authority of India Limited during 2002-05. He was Alexander von Humboldt Fellow in Germany during 1980-81. He was honored in 2009 by the Indian Institute of Science in Bangalore with the "Centenary Year Distinguished Alumni" Award.

A technologist of international reputation, he received the prestigious National Metallurgist Award of the Ministry of Steel, Government of India in the year 2003. He is Fellow of the Indian National Academy of Engineering and the National Academy of Sciences and Member of the Asia-Pacific Academy of Materials.

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Mr. L. Pugazhenthy has been inducted as a Member, Research Advisory Council, Shri Maharshi Research Institute of Vedic Technology (SRIVT), Hyderabad. Other members of the council are (1) Dr. Baldev Raj, Director, IGCAR, (2) Dr. J S Yadav, Director, Indian Institute of Chemical Technology, (3) Prof. M Surappa, Director, IIT, Punjab, (4) Dr. Mohan Rao, Director, Centre for Cellular & Molecular Biology etc. SRIVT strives to ensure that the fruits of Vedic sciences and technologies are made available for the materials as well spiritual prosperity of mankind. As one of the research projects, recently SRIVT has developed nano particles of Iron, Copper, Lead and Aluminium through the herbal route.

National News

Scientists Create Element 117

London: Physicists have finally created the nuclear missing link on the list of observed elements – the super-heavy element 117, which is made of atoms containing 117 protons that is roughly 40 per cent heavier than lead. A team from the US and Russia produced the elusive element 117 by fusing together atoms of calcium and another rare, heavy element known as berkelium, filling in the final gap on the list of observed elements up to 118. Like all super-heavy atoms, elements 177 is unstable, lasting only fractions of a second before self-destructing in a cascade of lighter elements and particles. After smashing calcium atoms into a target of berkelium in a particle accelerator at the Joint Institute for Nuclear Research in Dubna, Russia, the team deduced fleeting existence of element 117 by studying the daughter particles emitted as the atom decayed. Despite the atom's short life-time, element 117 lives longer than many lighter elements.

Courtesy: Mr. L. Pugazhenthy, ED-ILZDA & Ex. President, IIM

Check the metal

Health knows metallosis, a rare complication caused by metal implant

Sixty-year old Priya Gill has been complaining of knee ache sometime. Even after popping pain killers or applying analgesic gels regularly, the ache has refused to subside. Priya consults an orthopaedic who tells her she might have metallosis. Some 10 years ago, Priya broke her knee which was fixed with the help of a metal implant. Her doctor now suspects that the ache is due to the presence of the metal particles in the surrounding tissues. Or it could be that the metal particles of the implant have loosened over time. The solution lies in Priya either getting the metal particles removed through surgery or get the implant replaced by a new improved version. Says Dr. Suneel Kumar, head of department, Orthopaedics, BLK Memorial Hospital, New Delhi, This is a rare complication but it does happen to some patients. The quality of the metal used in the implant or its specific design can lead to metallosis. Usually, a combination of metals is used in implants, the main components being high grade stainless steel and titanium. He says whether the metal particles need to be removed is decided after checking the patient. Each case is different. If the pain continues, we generally prefer to remove it to ease the pain. Mind you, the metal particles do not cause infection. They cause only pain.

Better Implants

There are no specific tests to confirm metallosis but Dr. Kumar says, "An X-ray can easily spot the problem". Knowledge of metallurgy, he points out, is improving every passing day which has succeeded in making the implants for better than what they were a decade ago. Now, we get top of the design implants from abroad. Even the local implants are not bad. Apart from acute pain, which usually starts as constant dull ache, the common symptoms of metallosis are tenderness and swelling of the area.

(Contributed by Ms. Sangeetha Barooah Pisharoty, The Hindu)
Courtesy: Mr. L. Pugazhenthy