PROGRAM DETAILS OF

Prof. Brahm Prakash Memorial Lecture

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Platinum Jubilee Lecture

On Saturday, 21st August, 2021

❖ 4.00pm	Introduction	: MC – Ms Vaishakhi Nandi, HAL Joint Secretary, IIM (BC)
❖ 4.05pm	Welcome	: Dr R R Bhat Chairman, IIM (BC)
❖ 4.10pm	Address by President, IIM	: Mr T V Narendran CMD, Tata Steel
❖ 4.15pm	About PJ Lecture series	: Dr R Balamuralikrishnan, Scientist, DMRL Co-ordinator, PJ Lecture series
❖ 4.20pm	About Prof BPML	: Dr M. Sujata, Scientist, NAL Vice Chairperson, IIM (BC)
	Guest of Honour	: Prof. D. Banerjee, IISc
❖ 4.25pm	Introduction of Guest of Honour	: Prof. Satyam Suwas Chairman, Dept of Materials Engg., IISc
❖ 4.30pm	Introduction of Speaker	: Dr Dipankar Banerjee
❖ 4.35pm	Prof BPM L & PJ Lecture	: Dr K.N. Vyas Chairman, Atomic Energy Commission, GoI
❖ 5.35pm	Q&A – Chat / Raise hand	: Questions (limited)
	Presentation of E-Plaque	: Dr Dipankar Banerjee
❖ 5.45pm	Vote of Thanks	: Dr Abhik Choudhary, IISc Vice Chairman, IIM (BC)

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Achieving "Atma Nirbharta" in Materials for use in Nuclear Energy Sector

K. N. Vyas

Department of Atomic Energy

Nuclear energy is one among the high-end technology sector and like many such similar sectors, it needs special "sector-specific" materials. The work related to development of atomic energy was initiated in 1954 with establishment of Atomic Energy Establishment at Trombay (AEET). The centre was subsequently named as Bhabha Atomic Research Centre after the demise of Dr. Homi Jehangir Bhabha.

The team led by Dr. Bhabha at AEET, had envisaged complete self-reliance in materials. The materials which immediately come to mind, for nuclear energy, are uranium and zirconium which are indeed the key materials for the sector. The team led by Professor Brahm Prakash had a clear understanding that real self-reliance in these materials imply use of raw materials mined from Indian soil; beneficiation of these raw materials using indigenous processes; subsequent metal extraction; suitable alloying; and finally, production of the finished components for use in nuclear reactor.

DAE utilises a variety of materials for its needs in varied fields. Due to strategic uses of the special materials, DAE has faced restriction on material supply from abroad. This has disrupted the nuclear power programme significantly. However, this has also helped DAE scientists and technologists to rise up to the challenge and develop technologies for indigenous production of all the materials needed. Various units of DAE have worked in a large spectrum. However, in this presentation, only some of the materials have been chosen. Developments carried out for the following materials are described:

i) Development of zirconium-alloy based pressure tube for Pressurised Heavy Water Reactors. In recent years, a new flow-sheet for Zr-2.5 Nb pressure tube manufacturing has been established which gives improved properties.

ii) Development of reactor pressure vessel steels planned to be used for Indian PWRs. Identification of the appropriate composition and its fabrication into large sized pressure vessels is a challenge which has been overcome.

iii) SS 316LN having optimised nitrogen content, for use in sodium-cooled fast reactors for extending the design life of the reactor from 40 to 60 years. This material has better creep and low cycle fatigue properties, and is also more resistant to creep–fatigue interactions.

iv) Development of material for passive catalytic recombiner devices for hydrogen, for its use in nuclear power plants to mitigate the threat due to hydrogen generation during loss of coolant accident. Noble metal catalyst-based Passive Catalytic Re-combiner Devices (PCRDs) have been indigenously developed and is being used by NPCIL in PHWRs.

v) Development of high purity germanium using zone refinement principles, by optimizing the process parameters like induction power, molten zone length, refinement speed, atmosphere, etc. using the optimization, the purity of commercial 4N germanium has been enhanced by several orders of magnitudes.

vi) Development of technology for production of high purity neodymium metal by calciothermic reduction process (CTR) up to 10 kg per batch scale at BARC to produce high quality Nd metal from indigenously available Nd_2O_3.

The presentation aims to highlight the importance of the development from perspective of DAE and the struggles faced by various DAE scientists as a part of development and also describe the collaborative spirit exhibited to achieve the success.

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