Foreword

Accelerator Driven Sub-critical System (ADS) is the technology of nuclear energy and incineration of the nuclear waste. Although it has a history of only one decade, yet, many countries have drawn roadmaps of development of this technology. Dr Anil Kakodkar, Chairman, Department of Atomic Energy, has identified ADS to be the forerunner of the hybrid techniques of nuclear power generation and it is going to be more acceptable to the society from the point of safety and ecology because first of all it is sub-critical and secondly it is capable of reducing the danger of nuclear waste. In a way, ADS will be a new kind of system of nuclear energy using a source of high energy neutrons, independent of the kind of nuclear fuel, i.e. fissile, fertile or even higher actinides, having features of incineration of nuclear waste at a fast rate. Thus, ADS being capable of using thorium as a fuel in a big way extends the possibility of India to be self-reliant in the field of nuclear energy because of high reserves of thorium in the country. In 2003, the Department of Atomic Energy started a program of physics studies of ADS under its 10th plan budget and recently it has consolidated its three-stage Indian nuclear program to use thorium in PHWR in the second stage and APHWR + ADS in the third stage.

From the point of research and development of the technology, collection of high precision nuclear data of high energy reactions of neutrons, developing methods of shielding of high energy neutrons and study of the effects of higher order (n, xn) reactions on the fuel cycles are big tasks on one side and the challenge of developing high current (tens of milliampere) accelerator and design and modeling of spallation target on the other side. In the Indian context, development of even a proton accelerator of microampere current will be treated as the first indigenous development. In this scenario, the workshop was planned to be held before March 2006 as part of the activities of our ILTP project to exchange views, initiate collaborations, take stock of the present scientific achievements of the advanced laboratories and to plan future activities jointly. As pointed out above, although this field of research and development is very young and nascent, a sizable number of researchers working at various centers of DAE, IIT and Universities responded with enthusiasm to the call of the workshop and 36 talks and papers from both India and abroad were available for presentation.

The first formal workshop on ADS was inaugurated by Dr S Banerjee, Director, BARC at the Department of Physics, University of Rajasthan, Jaipur on January 23, 2006. The workshop was sponsored jointly by the Board of Research in Nuclear Sciences (Department of Atomic Energy, India), Long Term Co-operation Program of Science and Technology between India and Russia (ILTP), DST (Government of India) and University of Rajasthan, Jaipur.

The keynote address was delivered by former Homi Bhabha Professor S S Kapoor. Besides the two informal talks at the workshop, 30 talks/papers, out of which 13 by foreigners and 17 by the Indian team of researchers on the six theme subjects were presented over a period of three days. Preliminary details of these talks have been published as news in *Current Science* 90 (2006) 1173–74. The Abstract Booklet and the power point presentations on CD were made available to the participants during the workshop.

For publication of this proceedings volume a team of editors was appointed and texts of the talks and papers presented at the workshop were sent to the experts for peer review. After reviewing, only 23 talks/papers were found suitable for publication in this special issue of *Pramana*.

Organizers are specially thankful to Shri R K Sinha, Director Reactor Design and Development Group, BARC for his high spirited co-operation and for inducing enthusiasm in BARC scientists to make the workshop a symbol of the country's readiness to take up the task of ADS technology.

I am thankful to the following subject experts, namely, Dr V V Seliverstov of ITEP, Moscow, Dr S Srivenkatesan, Dr V Jagannathan of BARC, Mumbai, Dr P K Sarkar of VECC, Kolkatta and Dr V K Senecha and Dr Gurnam Singh of RRCAT, Indore for undertaking a part of the task of peer reviewing along with the team of editors comprising Dr S Kailas, Dr S Ganesan, Dr S B Degweker and Shri P K Nema of BARC, Mumbai. Also, the hard work of Dr S K Gupta, Dr H Kumawat and Mr Manish Sharma for preparing the Abstract Booklet as well as compilation of the edited papers of this proceedings volume is acknowledged with thanks.

Last but not the least, the organizing committee acknowledges thankfully the co-operation of Dr P P Chandrachudan of BRNS (DAE), Dr Y P Kumar of ILTP (DST) and the University of Rajasthan for financial assistance. Also, I feel thankful to all those who have participated in the workshop and to those who have worked for the successful organization of the workshop.

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