

# 第7回先端基礎研究国際シンポジウム 「荷電粒子およびフォトンの物質との相互作用」 ASR2007 "Charged Particle and Photon Interactions with Matter"

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The ASR2007 Symposium, an international symposium on "Charged Particle and Photon Interactions with Matter" was held on November 6-9, 2007 at the Advanced Science Research Center (ASRC), Japan Atomic Energy Agency (JAEA). The Symposium was organized by the Group of Basic Radiation Research (BRR) of ASRC with the chair, Prof. Y. Katsumura, the guest-group leader of BRR and the head of the Department of Nuclear Engineering and Management, the University of Tokyo.

About 135 participants, including 44 overseas ones from 12 countries and including 15 graduate students, very well representing the most active research groups in the world, have joined the Symposium. 47 invited talks and 58 posters have been presented.

The Symposium has been planned with a scientific scope which is based on that of the book entitled "Charged Particle and Photon Interactions with Matter. Chemical, Physico-chemical, and Biological Consequences with Applications," edited by A. Mozumder and Y. Hatano, Marcel Dekker, Inc., New York (2004) (with 870 pages for 27 chapters, ISBN: 0-8247-4623-6) and intended to discuss the state-of-the-art and future perspectives of the entitled research fields.

The interaction of ionizing radiation with matter was observed almost immediately after the discovering of X-rays and electrons in the last decade of 19<sup>th</sup> century. It wasn't named as 'radiation chemistry' until 1942 and it was greatly expanded in 1960s and 1970s. At present, this field has developed into a vigorous discipline in combination with radiation physics, radiation biology, and even photochemistry. The ASR2007 Symposium has well reflected the important roles of these research fields in advanced science, the state-of-the-art technologies, and the new features of these fields nowadays.

Radiation chemistry, the unique chemistry of high-energy radiation environments, if regarded as a branch of physical chemistry and chemical physics, is important for studies of fast kinetics and chemical reaction

mechanisms, because it can provide access to species in unusual oxidation states, excited molecules, free-radicals and ions that are otherwise difficult to produce in quantities sufficient for such studies, some of which are of biological importance. Besides its intrinsic importance of basic research, the applications of radiation chemistry become ubiquitous in modern society, for example, the water chemistry of nuclear reactors, the reprocessing of spent fuel, the synthesis or modification of new functional materials such as nano-particles and nano-gel, the direct and indirect effects on DNA or protein damage, the radiation therapy oncology, etc.

Thanks to the great progresses in laser, fast electronics and computer technologies, many sophisticated facilities, such as heavy-ion accelerators, synchrotron light sources, ultrafast electron accelerators, have been constructed. The energy of these ionizing radiation sources covers a rather wide spectrum, from several tens GeV heavy ions, a few tens MeV accelerated electrons to a few tens eV low energy electrons. The time resolution for kinetics studies as short as picoseconds or sub-picoseconds has been applicable. It is expected that all these new tools could be efficiently used for resolving chemistry problems from now on, especially the early events of radiation chemistry.

Radiation research has also interdisciplinary features in combination with physics, chemistry, biology and medicine, etc. It vigorously embraces many newly growing fields or new needs, for example, nano-materials and nano-technology, new media such as supercritical fluids and ionic liquids, heterogeneous systems, etc. In addition, taking advantages of the highly developed computing techniques, it is possible to reveal (or sometimes visualize) the early processes and spur reactions through Monte-Carlo or molecular dynamics simulations.

Accordingly, the topics that have been discussed during the four days Symposium are:



会議参加者の集合写真（先端基礎研究交流棟にて）

- Primary processes
- Electrons and ions
- Charged particles interaction with interface
- Ultrafast pulse radiolysis systems
- New trends in radiation chemistry
- Ion beams
- Industrial and medical applications
- Polymeric systems
- Radiation effects on DNA and proteins
- New media
- Interaction between exotic particles and matter

At the end of the symposium, Dr. J. Belloni from Université de Paris-Sud and Dr. M. Inokuti from Argonne National Laboratory gave summary talks, with dividing the above sessions into 2 groups. With their broad knowledge and profound understanding of radiation chemistry and its interface fields, both of the talks were splendid, interesting and stimulating. Dr. Belloni highlighted the main idea or results of each invited talk, while Dr. Inokuti summarized the invited talks with appropriate, witty, and sometimes critical comments. This symposium was organized by Basic Radiation Research Group which just started running from April 1, 2007. In spite of the challenging aspect, it's a good opportunity for the appearing of this new group to the community of radiation chemistry and its interface fields in the world. The symposium covered a wide

range of current and vital research lectures, which gave a remarkable impetus to further the advancements of the research fields corresponding to the title of this Symposium. Under the effective guidance by Prof. Hatano and Prof. Katsumura, with the joint efforts of the staffs at JAEA and the enthusiastic students of the University of Tokyo, the symposium was concluded to be successful.

#### ASR2007 招へい外国人研究者

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