Proceedings of the
7th National Meeting of Synchrotron Radiation Users
(KSUPS-7)

Poznań, Poland, September 24–26, 2007

Editors of the Proceedings

Wojciech Paszkowicz
Maciej Kozak

WARSAW
POLISH ACADEMY OF SCIENCES
INSTITUTE OF PHYSICS

Organized by
Adam Mickiewicz University, Poznań
in collaboration with
Polish Synchrotron Radiation Society (PSRS)

Hosted by Faculty of Physics and Faculty of Chemistry
of Adam Mickiewicz University

Programme Committee
Andrzej Burian, University of Silesia
Jolanta Darul, Adam Mickiewicz University
Krystyna Jałońska, Institute of Physics PAS
Maciej Kozak, Adam Mickiewicz University, *Chair*
Wojciech Kwiatek, Institute of Nuclear Physics PAS, *Treasurer*
Wojciech Paszkowicz, Institute of Physics PAS, *Editor*
Paweł Piszora, Adam Mickiewicz University, *Co-chair*
Kamil Szpotkowski, Adam Mickiewicz University, *Secretary*
Danuta Żymierska, Institute of Physics PAS

Sponsors
Ministry of Science and Higher Education
Bruker Polska Sp. z o.o.

Preface

During the last decades, synchrotron radiation (SR) has been used extensively in order to deepen understanding of the atomic structure, electronic structure and magnetic ordering of various advanced functional materials. Intense light sources have developed rapidly, especially since the mid-1990s. Their applications cover virtually all domains of condensed-matter studies (e.g. solid state physics, chemistry, materials science, structural biology, nanoscience) and medicine (diagnostics, therapy). The number of light sources systematically grows whereas the existing ones are upgraded and completed by new beamlines: the latter investments ascertain maintaining of the ability of the given source to be up to the challenges connected with contemporary science. The progress in the quality of the beams and of the data obtained at the specialised beamlines is impressive. One can either collect data in tens of femtoseconds, i.e. during the time when the length of light path is of the order of some micrometers only, or instead, to measure with resolution that is impossible to imagine at any traditional source: for example the powder diffraction beamlines equipped with assemblies of analysers can work with resolution of 0.001° (2Θ), i.e. 50 (!) times better than at traditional sources. The methods of modern X-ray optics permit to form parallel or focused beams of the section of several tens nanometers. Individual studies of nanoobjects using the X-ray beam became possible (until now they could be done using electron beams, only). The nature of the synchrotron light — the polarisation, coherence, high collimation and intensity — makes from it a powerful tool for insight into the nature of matter. One can study not only nanoobjects, but also large objects, due to the opportunity of using well-defined very hard beams. Spectacular achievements are noted in the field of imaging, where non-destructive techniques based on various physical principles permit for revealing the nature of objects that would remain undiscovered with traditional refraction or absorption based methods.

Despite the fast development of synchrotron and free electron laser sources, the knowledge about their existence (above 70 rings operating in the world now) and properties (quite different than those of traditional sources) is not widespread. This can be illustrated by an "adventure" of a British–Polish team. In 1995 they have got a beamtime at European Synchrotron Radiation Facility (ESRF, Grenoble) and transported some very small biological samples. They had to change the airplanes in London. They were asked there about their luggage. The discussion was short:

— What is it?
— Samples for studies at ESRF...
— What is ESRF?
— A modern radiation source...
— Radiation... This material will not be transported by any plane...

No excuse, the experimentalists had to go by train, because the officers did not even try to understand the nature and location of the radiation source.

In 1980s, Polish scientists started to use the synchrotron radiation systematically and the role of synchrotron studies for science and technology of modern materials became known. In 1991, the still small community of SR users decided to create the Polish Synchrotron Radiation Society (PSRS), which took the role of popularisation of the idea of using synchrotron beams. The community of SR users has grown here. Consequently, the number of scientific publications connected with SR increases. As a result of growing needs and of PSRS activity, in 2004, the year of access of Poland to European Union, Poland became a member of ESRF, a leading SR source in Europe. Now, a next step, membership of X-ray Free Electron Laser (XFEL, Hamburg) Consortium is being negotiated. Moreover, attempts to build own modern SR sources in Poland started and are supported by European Community.

Starting from 1991, the KSUPS meeting typically was organised in Warsaw or Cracow. In 2007, the synchrotron users community of Poznań hosted the KSUPS for the first time. The symposium took place at Faculty of Physics and Faculty of Chemistry at the Adam Mickiewicz University in Poznań. This meeting provided a survey of the state-of-the-art methods and their applications by Polish scientists. The scope of the present, KSUPS-7, meeting was very broad, covering all basic experimental methods and their applications in nanotechnology, chemistry/physics of materials, biology, paleobiology and medicine. The meeting presentations had the aim of promote the methods and encourage their more widespread application to solve various challenging scientific and technological problems. The symposium gave particular emphasis to the exchange of information on experimental possibilities at the available European synchrotrons and X-ray free electron lasers. During Symposium 9 invited lectures, 10 oral presentations and 51 posters were presented. From among the contributions at the symposium, the proceedings include 19 papers based on invited lectures, oral presentations and poster contributions. These papers report developments in scattering, spectroscopy and diffraction methodologies and obtained results. In addition to providing a documentation of the topics covered at the symposium, these proceedings are a review of current state of the synchrotron-based methods and their applications and may serve as a textbook for young scientists. The present volume extends the long series of proceedings of previous international and national meetings organised by or in collaboration with PSRS.

Wojciech Paszkowicz
Maciej Kozak
(Guest Editors)