

Panel Discussion „Crystallographic Applications of the Polish Synchrotron” at the Symposium of the Polish Crystallographic Society, Wrocław, June 29 – 30, 2007

Panel Discussion „Crystallographic Applications of the Polish Synchrotron” on 29th June 2007 has concluded the first day of the Symposium of the Polish Crystallographic Society (a twin meeting to the Polish Crystallographic Meeting, Wrocław 29-30 June 2007). The Panel Discussion session concerned the requirements and expectations of the crystallographic community with respect to the experimental possibilities at the future Polish synchrotron light source.

The discussion was chaired by Edward A. Görlich (Jagellonian University) who in his introductory remarks described briefly the present status of the project. It was pointed out that as a result of earlier broad consultation with world leading experts, changes were introduced to the original proposal. In particular, to achieve satisfactory parameters corresponding to state of the art of synchrotron-light-sources design, increased circumference of both the booster synchrotron and the storage ring were advised. The linac pre-accelerator will be rather used than a microtron and the machine will operate in a top-up mode. These technical modifications lead to estimation of the total costs for the completion of the first stage (i.e. for a building with media infrastructure, accelerator, storage ring and first 7 beamlines) at the level of 130 M€. Further four beamlines have been already proposed by independent research institutions or consortia.

Before proceeding to the main field of interest for this meeting, examples of synchrotron radiation applications for studying of structural and dynamic properties of condensed matter with non-diffractive methods were addressed by the first two speakers.

The talk by Witold Ryba-Romanowski (Institute of Low Temperature and Structure Research, Polish Academy of Sciences) referred to the synchrotron-radiation excited luminescence and fluorescence. Selected examples illustrated the applications of spectroscopic methods in studies of inorganic luminescent materials as possible candidates for scintillators and VUV to visible light converters. The main purpose of research is to reveal mechanisms of the light conversion process from the high energy radiation into the visible region. This is accomplished by analysis of luminescence decay curves for dopant lanthanide ions introduced into the host oxide crystals. The PLM3 beamline at the Polish synchrotron will make such measurements possible.

The presentation of Jacek Szade (Silesian University) concerned spectroscopic research techniques that are planned to be implemented in the first step of the project. As the introduction to the talk, a review of such techniques in the existing synchrotrons was shown with the conclusion that they still form one of the basic applications of synchrotron radiation. The concept of the PLU3 beamline was presented – undulator based radiation with changeable polarisation, relatively wide photon energy range (20-2000 eV) and multitechnique endstation. Photoelectron spectroscopy

and x-ray absorption would be the basic techniques with possible ways of development in the form of angle and spin resolved photoemission and resonant inelastic x-ray scattering (RIXS). The concept of multi-technique endstation and possible movable endstations at the same beamline was shortly discussed. Jacek Szade mentioned the spectromicroscopy as the possible direction of further development of the PLU3 beamline. Finally, a short description of the beamlines PLM1, PLM3, PLM4 and PLU6/PLW6 was given.

The discussion of diffraction lines was opened with the presentation by Wojciech Paszkowicz (Institute of Physics, Polish Academy of Sciences) of the proposal for the powder diffraction beamline PLU1. The speaker (i) has pointed the advantages of using the synchrotron beam for powder diffraction purposes (opportunity for ultrafast measurements, for getting out a very high resolution and studying extremely small objects, in particular, under high pressure), and (ii) emphasised the alternatives existing in the construction of the beamline, making specific applications less or more appropriate. In particular, the choice between focused and parallel beam optics is important, as well as designing the beamline in a way ensuring the best possible stability of beam position and intensity. It was suggested that achieving the wavelength about 0.3 Å is crucial for enabling valuable high-pressure diffraction experiments. Splitting the beamline was concluded to be the best way of avoiding the frequent configuration changes.

Maria Lefeld-Sosnowska (Warsaw University) discussed investigations of single crystalline materials by means of X-ray diffraction topography. The methods of topographic imaging with monochromatic or white beam was illustrated with the results for SrLaGaO₄ and GdCa₄O(BO₃)₃. The technique permits to determine and analyse extended crystal defects like dislocations, precipitates or deformations and strains resulting *e.g.* from inhomogeneities of the chemical composition. The application of the synchrotron X-ray sources for the X-ray Diffraction Topography and High Resolution Diffractometry has clear advantages over conventional laboratory equipment in particular due to a high brilliance, beam collimation and wider possibilities of the wavelength choice from the white beam. The proposal for the topography/HRXRD beamline PLW7, an initiative of several research institutions, is coordinated by Wojciech Wierzbowski (Institute of Electronic Materials Technology).

X-ray diffuse scattering as a function of temperature is one of the classical tools for analysing disorder in solids. Since the intensity of diffuse scattering is several orders of magnitudes smaller than the one of Bragg scattering, an intense synchrotron source is ideally suited to this type of experiments. Furthermore, the diffuse scattering experiments greatly benefit from highly parallel beam. During his talk, Adam Pietraszko has presented the needs connected with measurements in this area. In particular, he empha-

sised that scanning large areas of reciprocal space is most efficiently done with two-dimensional detector systems.

The application of high energy X-ray diffraction in investigations of carbon nanosystems was presented by Andrzej Burian (Silesian University). Precise information on structural properties of nanodiamonds, nanotubes and other carbon nanosystems may be described using the formalism of atomic pair correlation functions. Correlation functions may be determined with the synchrotron radiation which is greatly advantageous with respect to conventional means. It was pointed out that the technique exploits preferably high photon energies (of the order of 100 keV, to take as an example the ID15B beamline at ESRF) to cover as wide as possible k-value range permitting the transformation to a real-space distribution function with higher spatial resolution. Parameters of the planned Polish synchrotron will basically limit the photon energy to at most 40 keV thus the experiments in this field, if carried out, may be considered as preliminary and preparatory for the largest world facilities (ESRF, APS, Spring8 and future Petra III).

The field of protein and macromolecular crystallography (PX) has a good chance to be a stronghold of the Polish synchrotron project. Both, the number of Polish scientists actively involved in this area as well as the fact that our countrymen work permanently (or at long term sojourn) abroad, guarantee that the instrumentation of the proposed PX beamline and scientific merit of investigations performed there will be of highest rank. Mariusz Jaskólski (Adam Mickiewicz University) concentrated on problems concerning diffraction methods at the synchrotron light source: monochromatic, anomalous multiwavelength (MAD) and Laue technique. His concise review started with a scrutiny of the research centres in Poland and neighbouring countries that may be concerned as potential users of our future facility. The protein crystallography beamline has to meet following general specification: undulator as a radiation source, high geometrical ($< 5 \mu\text{m}$) and wavelength stability ($< 10^{-4} \text{ \AA}$) at a high degree of monochromaticity with the high beam intensity in the range $0.9 < \lambda < 1.1 \text{ \AA}$. The line is included in the set of first seven beamlines to be realised (PLU4).

Edward A. Görlich, Wojciech Paszkowicz



European Powder Diffraction Conference, EPDIC-11 18 – 22 września 2008

W dniach 18–22 września 2008 odbędzie się w Warszawie Europejska Konferencja Dyfrakcji Proszkowej (European Powder Diffraction Conference, EPDIC-11). Przewodniczącym konferencji jest Prof. Bogdan Pałosz (Instytut Wysokich Ciśnień PAN, Warszawa).

Konferencja EPDIC-11, choć w nazwie europejska, jest jedyną cykliczną światowej rangi konferencją poświęconą wykorzystaniu dyfraktometrycznych technik proszkowych dla badania struktury materiałów. EPDIC jest miejscem wymiany doświadczeń przez uczonych zajmujących się technikami, teorią i praktyką dyfrakcji oraz analizą struktury i mikrostruktury materiałów polikrystalicznych. W eksperymentach z tej dziedziny wykorzystywane są zjawiska dyfrakcji promieni rentgenowskich emitowanych przez źródła klasyczne i synchrotronu, neutronów i elektronów. Źródła synchrotronowe zdecydowanie dominują w tych działach dyfrakcji proszkowej, w których wymagane są dobór długości fali lub niewielka długość fali (poniżej 0.7 \AA), oraz gdy badane obiekty mają małe rozmiary.

EPDIC-11 jest czwartą w historii dużą międzynarodową konferencją z dziedziny krystalografii organizowaną w Polsce. Poprzednio odbyły się:

11. Kongres Krystalograficzny, Warszawa 1978,

10. Europejska Konferencja Krystalograficzna (ECM-10), Wrocław 1986,



Main building of the conference site, Warsaw University of Technology.

20. Europejska Konferencja Krystalograficzna (ECM-20), Kraków 2001.

Szczegóły dotyczące konferencji EPDIC-11 można znaleźć na stronie internetowej <http://www.epdic-11.eu/>

FIRST MEETING OF INTERNATIONAL ADVISORY COMMITTEE FOR POLISH SYNCHROTRON PROJECT, KRAKÓW, 13-15. 02.2007

As the project of Polish synchrotron light source received acceptance of Polish authorities and assurance of a considerable part of funding, the preparatory works entered a new phase requiring a substantial help from foreign experts. The inaugural meeting of the advisory body took place in Kraków, February 13 - 15, 2007 and was attended by: Dr. Mark de Jong (CLS), Dr. Paweł Grochulski (CLS), Prof. Gerhard Grübel (DESY/HASYLAB), Dr. Peter Kuske (BESSY), Prof. Gerd Materlik (DIAMOND), Prof. Bill Thomlinson (CLS).

The following main issues have been addressed and discussed:

- Present status of the Polish Synchrotron project: (a) Preliminary concept for a size and technical features of the facility. (b) Experimental beamlines proposed for the stage I (7 lines) and for further development (4 lines) - presented by coordinators of the line projects. (c) Organisational & financial situation.
- New designs, recent constructions and technical solutions SR sources in the world.
- World market for synchrotron equipment producers and suppliers.
- Provisional candidates for the Project Leaders.
- Methods of cost estimation - how precise (reliable) they are?
- Time schedule of the project [our general philosophy is to contract as large as possible units of the machine].
- Education & training of young Polish scientists (in particular in accelerator physics)
- Formation of the International Advisory Committee.
- Structure and organisation of a responsible institution in the phases of planning, preparing and construction.
- Schemes for international collaboration.
- 'Roadmap' - overview.
- Practical advices: traps & surprises (unpleasant) - how to prepare for & avoid.

Thanks to expertise, broad experience and a very open attitude of our guests it was possible to elaborate a course of action for the nearest future. It comprises organisational steps which should lead in a possibly shortest time span to work out the Conceptual Design of the facility. This complex and demanding task requires involvement of the experienced specialists, in particular in the field of accelerator physics and technique. A far reaching help in this respect has been offered.

Furthermore the following primary conclusions have been conceived or corroborated:

1. To better meet requirements and expectations of the prospective users and to satisfy in a best possible way the presented scientific case (in particular with respect to high photon energy beamlines) it is indispensable to enhance the originally proposed parameters of the machine (the circumference should be rather 220 m or larger, larger dimensions of the booster synchrotron system with initial linac accelerator).
2. Optimisation of the proposed beamlines should be performed to make the completion in the first construction step realistic.
3. New estimates of costs have been done, ensuring safe completing of the project in its present scale (according to the results of this Conference; with 7 beamlines, as planned) {130 M€} (allowing among other factors, for inevitable increase of wages and general costs).
4. Intensify efforts to build up a team of well trained specialists both in accelerator and beamline physics and techniques. This should be accomplished by topical courses in Poland, supplemented by, preferably long-term (1 - 2 years) training at synchrotron facilities abroad. Many potential centres and support possibilities were specified.
5. Document circulation and retrieval, information exchange and work organisation should be clearly defined from the very beginning.
6. During preparation, construction and commissioning phases of the project a great caution and scrupulousness should be devoted to rigorous planning both on short- and long-time scale.



9th International School and Symposium on Synchrotron Radiation in Natural Science (ISSRNS'2008), Ameliówka, 15th-20th June, 2008



Conference site: Hotel Ameliówka.

fol. W. Paszkowicz

The 9th International School and Symposium on Synchrotron Radiation in Natural Science (ISSRNS'2008) will be held in the Ameliówka Hotel (Małocice Kapitulne near Kielce) on 15-20 June, 2008.

ISSRNS is a series of meetings, organised every two years, devoted to recent advances and new techniques employing synchrotron radiation in physics, chemistry, materials science, biology and medicine. The 9th meeting will be organised by the Polish Synchrotron Radiation Society with cooperation with Institute of Physics, Polish Academy of Sciences (Warsaw, Poland).

Specialists from synchrotron centres will be invited to deliver lectures on hot topics related to wide applications of these new sources of electromagnetic radiation in various domains. Poster sessions will be organised to present recent achievements and results. The collected abstracts will be published in a volume of *Synchrotron Radiation in Natural Science*, and the proceedings in a reputable international journal.

The meeting language is English.

The topics of the meeting include:

- synchrotron and alternative radiation sources – instrumentation,
- synchrotron radiation in life sciences,
- macromolecular crystallography,
- x-ray absorption, fluorescence and photoelectron spectroscopies,
- magnetic dichroism,
- x-ray diffraction,
- x-ray scattering,
- nanocrystals and nanostructures,
- applications of free electron lasers.

The meeting will be held in a comfortable hotel Ameliówka (10 km from the district capital Kielce) located in the mid-

dle of the Świętokrzyskie (Saint Cross) Mountains, a wooded mountain range in central Poland (the oldest mountains in Poland and one of the oldest in Europe). They are covered by remnants of a primeval forest with beautiful rivers, caves, hundreds of unique relics of the past (like striped flintstone mine from neolith epoch in Krzemionki Opatowskie or relics of ancient metallurgy). Amateurs of active tourism will find marked hiking and cycling routes. At some tens of kilometer distance from the conference site there are, apart of the interesting old town of Kielce: the famous Raj (Paradise) Cave, Jędrzejów town with a large collection (third in the world) of sun clocks in a unique museum, the 1200 years old oak tree „Bartek”, many remains and museums of old industry, and the manor house in Obłęgorek with a museum of Henryk Sienkiewicz, the author of the commonly known *Quo vadis* (1896, Nobel Prize 1905 for the author, the book filmed twice in France and Italy in 1913 and many times later).

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