3 Workshops and Seminars

3-1 PF Symposium

The 26th PF Symposium, the annual users' meeting, was held on March 24-25, 2009 at the EPOCHAL Tsukuba. More than 300 users and PF staff participated in the Symposium. The main purpose of the PF Symposium is to discuss the present status and future projects of the PF. In addition, users and the PF staff promote mutual friendship through scientific presentations and discussion. In the first part of the symposium, PF staff reported on the status and recent progress of the facility. We invited six speakers for special lectures: five from outside and one from inside the PF. Four oral sessions were held on four important topics. "Present Status of the Developments at the PF/PF-AR and Their Future Plans" from both the viewpoints of the light-source and the utilization, "Beamline Upgrade/Abolishment, Group System, and International Advisory Committee", and "Energy Recovery Linac Project (ERL)". There were 220 user poster presentations, with results presented from 12 S-type and 5 U-type proposals. There were 49 presentations from the staff of the Accelerator Laboratory of KEK, Neutron Science Division of IMSS and the PF staff, resulting in a total of 286 poster presentations.

3-2 PF Workshops

Eight PF workshops were held in FY2008 with the approval of the PF Program Advisory Committee (PF-PAC). Anyone can propose such a workshop. Free discussion is made upon a specific scientific topic in synchrotron-radiation research and its related application fields. The proceedings of the workshops are found in the KEK proceedings, which are available at the Library KEK.

(1) "Recent Development of Magnetic Imaging" held on Septmber 29-30, 2008 at the KEK, KEK Proceedings 2008-17 (in Japanese).

Magnetic imaging is a technology that visualizes the magnetic information and is used widely from the observation of nano magnets such as ultra high precision magnetic recording materials to the observations in the macroscopic regions as electromagnetic steels. This meeting pursued the discussions on the present status and future prospect of such microscopic and macroscopic imaging techniques.

The magnetic imaging using synchrotron radiation (SR) such as XMCD-PEEM and soft X-ray holography recently collects much attention. In this meeting, not only such SR techniques but also other techniques were discussed, focusing their merits and demerits. The latter included magnetic imagings such as probe microscopes, electron beams, and magnetic sensors, and micro magnetic simulations that are rapidly developing recently. The participants had chances to overview the present status of such technology.

(2) "High Advantage and Prospect of Small-Angle Scattering in Nano-Structure Analysis and Sensing" held on September 18, 2008 at the PF. KEK Proceedings 2008-8 (in Japanese).

In various materials including solids, soft matters and biological materials, a study in nano-structures is scare, and is strongly correlated with elucidation of material function in materials science and invention of new materials. Especially, recent development of technology on micro electro mechanical systems, nano electro mechanical systems, nano bio-sensing and control of interfacial atoms and molecules is remarkable, precise and prompt nano-structure analysis becomes increasingly important for fundamental material science and industrial applications.

X-ray small angle scattering (SAXS) measurements at the Photon Factory makes an important and leading role for over 25 years in characterization of nano-structures. Meanwhile, technological developments such as SAXS-WAXS simultaneous measurements, GI-SAXS measurements have been done. However, unfortunately, essential cares for improvements on beamlines and other fundamental equipments has not been paid, and the present status of the whole beamlines for SAXS measurements is not favorable to meet the demand for the study on nano-structure of various materials.

In this workshop, we have recognized the importance and demand of nano-structure characterization, discussed on the recent studies using SAXS together with the technical developments of the relevant fields for surveying future utilization and developments of X-ray small angle scattering measurements with synchrotron radiation.

(3) "Workshop on the Application of the Synchrotron X-ray Technique to Electrochemistry" held on August 5-6, 2008 at the PF. KEK Proceedings 2008-10 (in

Japanese).

Electrochemistry gives a basis of various applications such as fuel cells and biosensors. Because of the growing demand for them, in situ observation of the electrochemical reaction with atomic resolution is highly required. However, the existence of the solution layer that plays the electrochemical reaction prohibits the application of most kinds of the surface sensitive technique. Hard X-ray technique — scattering, diffraction and spectroscopy — is one of the rare methods that allow us to measure the electrode surface structure through the solution layer. This workshop was held with the aim of to make a good communication among the scientists working on this area as well as to present the value of this technique on electrochemistry.

In order to have a good knowledge on electrochemical reaction, we need time dependent measurements and high-resolution data for the electrode surfaces. Although both of them are challenging, the time resolved measurements are made with EXAFS technique, and the high-resolution measurements are made with surface X-ray scattering method. In the workshop, ten brilliant presentations for both techniques were made. All the participants exchanged their knowledge and experiences, which helps the growth of the electrochemistry study with synchrotron X-rays.

(4) "Recent Research Activities and Future Prospect of Angle Resolved Photoemission Spectroscopy" held on December 17-18, 2008 at the PF. KEK Proceedings 2008-18 (in Japanese).

Two years have passed since the BL-28A, a dedicated beamline station for the angle resolved photoemission spectroscopy (ARPES), was first provided for the users, and we now see plenty of results.

Meanwhile, the ARPES at the bending magnet beamilne BL-1C required discussion about its future development under the present movement of beamilene reconstruction although it showed fruitful results on in situ ARPES for thin films.

With such a background, the purpose of this meeting was to summarize the outcomes that had been obtained until that time using the ARPES at PF and to discuss the future direction of the development.

It was also intended to have opportunities to share the information about the domestic and foreign facilities among domestic ARPES researchers and to prompt the researchers to use different facilities more actively, asking some of them to give lectures on the frontier of the ARPES.

(5) "Development fo Fluorescence XAFS Measurements and Researches" held on March 10-11, 2009 at the KEK. KEK Proceedings 2009-1 (in Japanese).

Fluorescence X-ray absorption fine structure (fluorescence XAFS) measurement is one of the XAFS measurement modes. The fluorescence XAFS measurement has been utilized for the samples which are difficult to be measured by normal X-ray absorption measurement, i.e., samples on thick substrates and samples in which target elements are diluted.

Recently, the fluorescence XAFS measurement is considered to be an important tool in the field of materials science and environmental science to analyze the states of diluted elements. Further, advanced measurements by monochromatizing the fluorescence X-ray are energetically studied to achieve a state-selective measurement.

On the workshop, firstly, the fields where the fluorescence XAFS measurement is applied were reviewed and the most advanced researches were lectured. Secondly, the development of the fluorescence XAFS measurement in the near future by the development of the X-ray source, measurement system, and measurement technique was discussed, considering that the construction of new synchrotron radiation source, ERL, was planned at KEK.

(6) "Future Prospective Investigation using Soft X-Ray Undulator Radiation" held on January 13-14, 2009 at the KEK. KEK Proceedings 2008-19 (in Japanese).

The purpose of the workshop is to discuss the current status and near-future prospects of BL-2C. The undulator of ID#02 at the PF was constructed in 1983. The monochromator of BL-2C was reconstructed in 1995 with leading-edge technology at that time and still can meet the demand of current users. On the other hand, two other soft X-ray undulator beamlines, BL-28 and BL-16, have been reconstructed and improved. The attractiveness of BL-2C starts to fade even at the PF. Potential as well as current users gathered and discussed how to promote the efficiency of the current activities over the next few years. Moreover, options to stimulate potential users and regain competitiveness over the next decade were discussed.

(7) "Research Activities at the 2.5-GeV PF Ring with Top-Up Single-Bunch Operation and Future Prospect" held on November 7-8, 2008 at the KEK. KEK Proceedings 2008-11 (in Japanese).

This workshop is the fourth in a series of workshops. The previous workshops were held at the PF in 1981, 1990 and 1996. The purpose of the present workshop was to share the scientific activities from various research groups, who use the single-bunch operation at the 2.5 GeV PF Ring. Since the first single-bunch operation for the user experiments at the PF, the quality of the single-bunch operation has been improved with a sincere effort of the light source staff. It should be noted that most single-bunch users are very satisfied with the top-up injection, which makes it possible to supply a stable synchrotron radiation with a constant stored current of 50 mA. In addition to several user groups using the single-bunch operation for these several years, new experiments are now being proposed; direct observation of magnetization dynamics, real-time observation of

chemical reaction on surface, and time-resolved spectroscopy with a combination of laser pulses. During the workshop, the possibility of a specific bunch-fill, where one bunch for the half circumference and multi0bunches for another half circumference are filled, which can be used not only by the single-bunch users but also by the other users who need a higher flux. This certainly increases the opportunity that the users can access the practical single-bunch operation with the introduction of the top-up injection.

(8) "The 4th Symposium on Powder Diffraction Method – New Techniques and Applications of Powder Method" held on December 25-26, 2008 at the KEK. KEK Proceedings 2008-13 (in Japanese).

This workshop was the fourth in a series of workshops. The first and the second workshops were held as the PF workshop in respectively 1997 and 2001, and the third as the IMSS workshop in 2004. The experimental and analysis methods using powder diffraction advanced in four years since the last workshop. Recently, it is requested that detailed structural information is obtained accurately and efficiently in the functional materials, the medicine and the life science fields in addition to the main current materials science. The purpose of the workshop was to share the latest methodology and technology for structural analysis on the basic science and the applied research in various fields, and to discuss future developments in powder diffraction.

3-3 PF Seminars

Eighteen PF seminars were held in FY2008. They were given either by visitors, and a list is given in Table 1. The topics of the seminars covered a wide range of science, mainly related to synchrotron-radiation research. Topics included the electronic structure and atomic structure of condensed matters and their surfaces, X-ray diffraction analyses of solids and bio-molecules, ultrafast time-resolved dynamics, high-resolution real-space imaging, new interesting materials, structural analyses of matters under extreme conditions, new light sources and insertion devices, electron-beam stabilization, and electron- and light-beam monitoring.

Table 1 List of PF seminars held in FY2008.

Theory of Cu Kα Resonant X-Ray Emission Spectroscopy in High-Tc Related Materials KOTANI Akio (KEK-PF & SPring-8) May 8, 2008
NSLS II Project and Its Vacuum System Design HSEUH Hsiao-Chaun (BNL, USA) Jun. 2, 2008
Approach to Probes of Se Containing Carbohydrate Chains for Structural Biology on Carbohydrate Chains ANDO Hiromune (Gifu Univ.) Jun. 9, 2008
Photon Metrology using Synchrotron and FEL Radiation RICHTER Mathias (PTB, Germany) Jun. 12, 2008
Charge-Transport Mechanisms in Thin Organic Films and at Interfaces Studied using Advanced Photoelectron Spectroscopies FRIEDLEIN Rainer (JAIST) Jun. 17, 2008
Development of Environmental Chemistry Based on Synchrotron Radiation X-ray Spectroscopy TAKAHASHI Yoshio (Hiroshima Univ.) Jun. 19, 2008
Construction and Commissioning of the Australian Synchrotron Facility LARKINS P. Frank (Univ. of Melbourne, Australia) Jun. 30, 2008
Development of Positron Microscope in KEK FUJINAMI Masanori (Chiba Univ.) Aug. 4, 2008
Femtosecond X-ray Crystallography of Bismuth and Tellurium: Dynamics on the Time Scale of an Optical Phonon Period JOHNSON Steven (PSI, Switzeland) Sep. 1, 2008
Bayes-Turchin Approach to the Analysis of Extended X-ray Absorption Fine Structure Data KRAPPE J. Hans (Helmholtz Center, German) Sep. 2, 2008

Macromolecular Crystallography at Diamond Light Source
WAGNER Armin (Diamond Light Source, UK) Sep. 3, 2008

The Roles of SLC26 Anion Exchangers in Epithelial Ion Transport
KO Shigeru (Nagoya Univ.) Sep. 4, 2008

An Analysis of Heavy Elements - Application to the Material History and the Environmental Science -
NAKAI Izumi (Tokyo Univ. of Sci.) Sep. 9, 2008

Toward Understanding the Patho/Physiological Implication of Ganglioside GM3
INOKUCHI Jin-ichi and UEMURA Satoshi (Tohoku Pharmaceutical Univ.) Sep. 10, 2008

Time-resolved Electron Cryo-microscopy Revealed Maturation Dynamics of a Pseudo T=4 Viral Capsid
MATSUI Tsutomu (The Scripps Research Institute, USA) Dec. 22, 2008

SESAME - A 3rd Generation Synchrotron Light Source for the Middle East
WINICK Herman (SLAC) Jan. 16, 2009

Structural Analysis of Semiconductor Materials and Devices — Physics between Crystal Growth and Properties —
TAKEDA Yoshikazu (Nagoya Univ.) Jan. 23, 2009

IKNO, a User Facility for Coherent THz Synchrotron Radiation
MARCELLI Augusto (LNF, Italy) Feb. 12, 2009

Time Resolved Simultaneous Analysis of Physical-chemical Processes in Materials Science
MARCELLI Augusto (LNF, Italy) Feb. 12, 2009

Regulation of Signaling by Ubiquitin and Ubiquitin Like Molecules
IKEDA Fumiyo (Goethe Univ. School of Medicine, German) Mar. 23, 2009