BL12B2
NSRRC BM

In 2003, the BL12B2 beamline, part of the Taiwanese X-ray facility at SPring-8, has been continuing in her operational track, serving for both Taiwanese and Japanese researchers in the fields of materials and bio-structural studies. This is the second year since the beamline officially opened for user operation in the 2001B period. We are glad to report that the beamline performance has been reaching the design specification and the four end stations are in well operational condition. In research, in the past two years, the BL12B2 users have promoted to fully utilize the beamline capability in exploring diverse research fields, ranging from physics, chemistry, materials science, semiconductors, environmental protection, biology etc. The adapted experimental techniques cover almost the existing X-ray structural probes, including powder X-ray diffraction, surface X-ray scattering, X-ray absorption spectroscopy, and protein crystallography. Several experiments were combing more than one technique for specific needs. It is because of the multi-fold detecting environment, the BL12B2 can easily rearrange the stations and combine several experimental techniques into one set-up. While acquiring non-ambient equipments, such as the cryostat and the diamond avil cell, the users are able to further extend their probing ambitions to low temperature and high pressure. Statistically, in 2003, the total number of user-runs at BL12B2 has kept the same level as in 2002 (*Fig. 1*), while the beamtime allocated between materials and bio-structural researches was balanced in a 50-50 policy that the users from either community share beamtime equally.

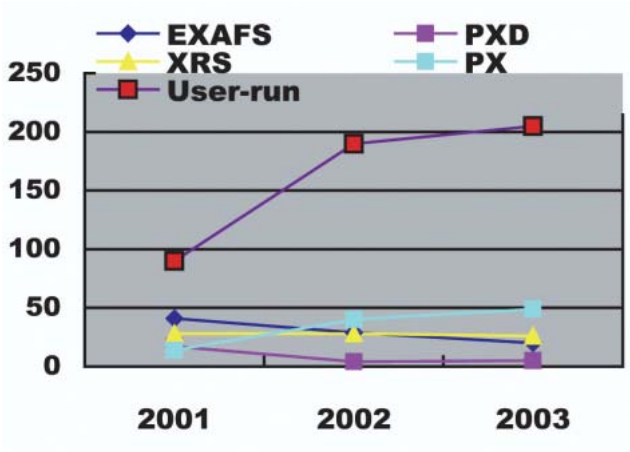

Fig.1 BL12B2 user statistics in year 2001 – 2003.

Continuing on the research momentum in 2002, this year, the nano-related researches were dominating in the materials studies in BL12B2. While probing the species with less ordering such like the nano-systems, the X-ray spectroscopy when incorporated with scattering technique usually provides determining information in structure. Specific examples at BL12B2 are the studies on, the composition distribution in semiconductor quantum dots (C-H Hsu and Y Stetsko of NSRRC) and quantum wells (D-Y Noh of K-JIST), the bimetallic alloy composition and phases in mesoporous molecular sieve (M-T Tang of NSRRC and K-J Chao of NTHU), the high pressure phase transition in NiAs-type magnetic semiconductors (C-M Lin of NHTC and K-T Wu of Soochow U.), carbon supported alloy catalysts for fuel cells (R-S Liu of NTU) and carbon supported silver nano-particles in microemulsion systems (B-J Hwang of NTUST), etc. In addition, the transport behaviour of the oxide conductor $K_{0.3}MoO_3$, which exhibits quasi-one-dimensional electron transport and metal-semiconductor transition due to charge density wave (CDW) at 180K, was continuously studied by X-ray multi-diffraction specifically by measuring the phase-shift due to externally applied electric fields (C-H Du of Tamkang U., M-T Tang of NSRRC and S-L Chang of NTHU). Initiated in 2003, the X-ray absorption spectroscopy was added to study the electronic properties of the same system (W-F Pong of Tamkang U.).

In structural biology, the BL12B2 has been providing a high performance station for protein crystallography since 2002B period serving for both Taiwanese and Japanese bio-researchers. The beamtime allocated to Japanese users, 20% of total user beamtime, is according to the contract conditions between NSRRC and JASRI, and is specifically assigned for the project of the *Microgravitorial and Industrial Proteomics with Synchrotron radiation* (MIPS). The protein user activity was continuously growing in 2003, which can be realized by the increase in beamtime allocation and user-runs compared to the previous year. Complementary to the protein crystallography station in Taiwan Light Source, the BL12B2 station has benefited Taiwanese users with fruitful results, for instance, in the crystal structure and functional studies of octaprenyl pyrophosphate synthase from hyperthermophilic *Thermotoga maritima* (A.H.J. Wang of Academia Sinica), the crystal structure of nucleoside diphosphate kinase from rice (C-J Chen

of NSRRC *et al*), the visualization of cell-defending nonspecific nucleases in DNA recognition and cleavage (H-S Yuan of Academia Sinica), and the functional role of the binuclear metal center in D-aminoacylase (S-H Liaw of NYMU).

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