Materials Science and Industrial Applications at SPring-8

Yoshiharu Sakurai : Japan Synchrotron Radiation Research Institute (JASRI)

SPring-8 has contributed to solving problems in materials science, life science and industries. Many outcomes have been produced by users, utilizing the SPring-8 performance, those of which are the pioneering work of HAXPES and its applications to materials science, development of extreme-condition materials science, product development led by SPring-8 - J-PARC - K Computer collaborations, and scientific advances in protein crystallography. In FY2017, annual user beamtime has been extended from 4,000 h to 4,500 h, which leads to increasing the facilities' availability for users. Taking advantage of this extension, new research fields, combined with advanced synchrotron techniques, will be developed for future outcomes.

SPring-8 provides low-emittance, high-energy synchrotron x-rays. Utilizing the characteristics, a variety of synchrotron methods are developed for materials science and industrial applications, including x-ray spectroscopies for probing quantum states, stable x-ray imagings with a 100 nm resolution, high energy x-ray techniques for in-situ or operando observation inside chemical reaction cells or technology-intensive products. These methods are used for understanding various phenomena, which take place in a multiscale range, from nanoscale in quantum physics to palm-scale in product engineering, through mesoscale in materials science. The upgraded SPring-8 under planning will reduce the emittance by orders of magnitude, leading to large advances in x-ray beam size control and coherent utilization. This advances will shift the multiscale synchrotron methods to next stage.

The research projects under the Element Strategy Initiative at SPring-8 are utilizing the SPring-8 performance. The programs are currently focused on materials science and quantum physics and in future expected to extend toward operando observation of material behaviors inside products or objects using high energy x-rays. Since technology-intensive products are produced based on knowledge and technology in materials science and quantum physics, understanding the relationship between different scale hierarchies, as well as the behavior within one scale hierarchy, is essential to industrial applications. For this purpose, closer collaborations in sciences between synchrotron, neutron and computation are important for the future.

SPring-8 Campus (provided by RIKEN)

External links

http://www.spring8.or.jp