

趣旨説明

Introduction to the Workshop

“New research developments at KEK-Slow Positron Facility
--- Positron diffraction and positronium beam --- “

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The KEK-IMSS-SPF provides a high-intensity, pulsed slow-positron beam produced by using a dedicated linac. The electron-beam energy of the linac is 55 MeV with the operation power of 600 W at the maximum. The maximum repetition rate is 50 Hz.

In October 2010, a new positron converter/moderator assembly was introduced, yielding an order of magnitude increase in the intensity of the beam. The long pulse mode (pulse width 1 μ s) provides 5×10^7 slow- e^+ /s, and the short pulse mode (pulse width variable 1-10 ns) provides $1-5 \times 10^6$ slow- e^+ /s.

The high intensity has made it possible to conduct experiments of reflection high-energy positron diffraction (RHEPD). The pulse nature of the beam together with the high intensity realized photodetachment of the positronium negative ion produced on sodium coated W surface.

From this year, two research projects closely related with this facility have started. One is “Development of High-brightness and High-intensity Positron Diffraction and its Application to Surface Studies”. The other is “Evolution of the positronium beam science using the technique of photodetachment of the positronium negative ion”

This is a joint start-up workshop of these projects. We invited Professor S. Y. Tong to give a key note lecture on the usefulness of the slow positrons for the surface structure analysis. Professor Tong is well

known as one of the world leader of the slow electron and positron diffraction theory. The monograph “Surface Crystallography by LEED” by Prof Van Hove and Prof Tong originally published in 1979 is a kind of bible which everybody in the field reads.

We also ask Professor A. Ichimiya, another leading physicist in the field of electron diffraction, to give a lecture on the theory of reflection high-energy positron diffraction, RHEPD. Prof. Ichimiya is actually the proposer of the method of RHEPD itself.

The talks in this workshop cover the results of RHEPD, those combined with other techniques such as ARPES and STM, and the high efficiency production of positronium negative ions and its application to the production of an energy-tunable positronium beam. Also included are the theory of photodetachment of positronium negative ions, positron annihilation induced surface phenomena, the technique of brightness enhancement of positron beams, energy recovery linac as the future light source, present status of the Slow Positron Facility, followed by a guided tour of the facility, applications of spin polarized positrons. Also, the expectations for the positron diffractions and the slow positron study of solids surfaces will be given. The workshop will be closed with an outlook of the facility.