

Small-area two-dimensional photoelectron spectroscopy

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【Outline of survey】

The demand for small-area analysis became important due to the down-sizing of devices used in, i.e., multi-functional mobile phone. The “two-dimensional photoelectron spectroscopy” developed by ourselves is a powerful analysis method, which can analyze three-dimensional band structure and atomic configuration. However it has been impossible to analyze small sample because the diameter of incident light beam is thicker than 1 mm. The acceptance angle of usual analyzer so far is limited to small angular range when the kinetic energy of the electron is high. In this project we complete the Stereo-PEEM (Stereo photoelectron emission microscope) and DELMA (Display-type Ellipsoidal Mesh-lens Analyzer), which were invented in JST-CREST project for five-years. They enable us to view the magnified image of the sample surface as well as the angular distribution of electrons. A laboratory x-ray source will also be constructed.

【Expected results】

Two-dimensional photoelectron spectroscopy for only one small crystal will become possible for the first time especially for high kinetic energies. The development of higher performance devices, i.g., Si solar cell, or Fe-RAM devices will be accelerated by the two-dimensional photoelectron spectroscopy analysis of only one particle. Because the low-dimensional and quantum mechanical effect, which are characteristic to small materials, can be revealed and contribute to science.

【References by the principal investigator】

- Stereo-PEEM for three-dimensional atomic and electronic structures of microscopic materials, H. Daimon, H. Matsuda, L. Toth, F. Matsui, Surface Science, 601(20) 4748-4758, (2007).
- Stereo Photography of atomic arrangement and atomic-orbital analysis by two-dimensional photoelectron spectroscopy, F. Matsui, T. Matsushita, F. Z. Guo, H. Daimon, Surf. Rev. Lett. 14(3) 1-7, (2007).

【Term of project】 FY2008—2012

【Budget allocation】

132,200,000 yen (direct cost)

【Homepage address】

<http://mswebs.naist.jp/LABs/daimon/index-j.html>