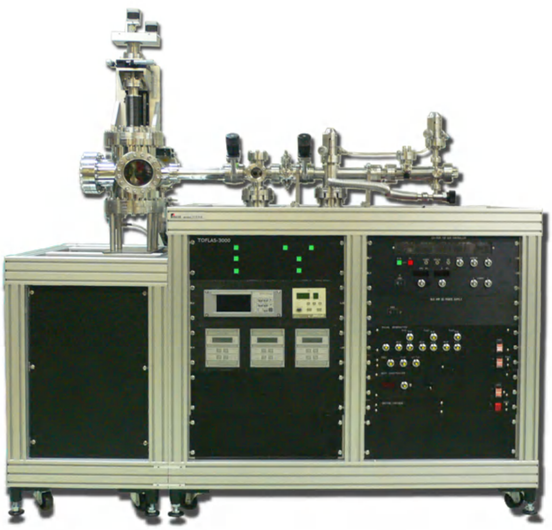
TOFLAS-3000

Pascal Co., Ltd.

Time of Flight
Low Energy Atom Scattering Spectroscopy



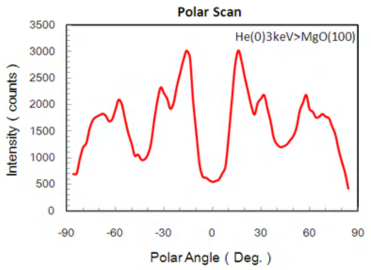
Surface Structure and Elemental Analysis
of
Thin Films, Ultra Thin Films, Monolayer Films,
Graphene and etc.,
for
Insulators, Semiconductors and Metals.

- ◆ *Atom scattering spectroscopy, TOFLAS, is sensitive to the top most several layers of crystal surfaces.*
- ◆ *TOFLAS Pole-figures make it easy to find surface polarity, crystal orientation and the crystallographic symmetry.*
- ◆ *Free From Electric and/or Magnetic Field.*

Typical examples of surface analysis

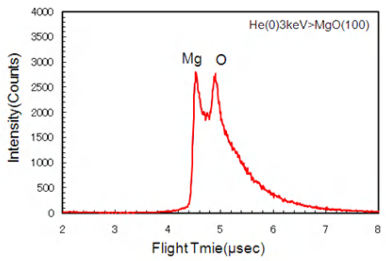
Structure

Polar Scan



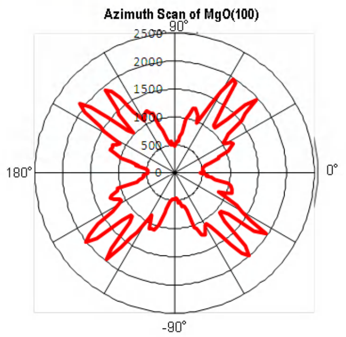
Element

TOF Spectrum

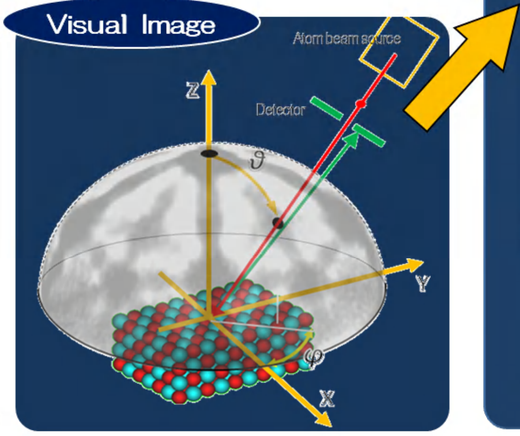


Symmetry

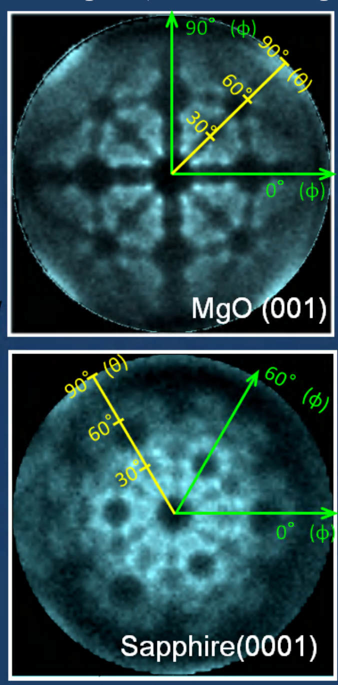
Azimuth Scan



Visual Image

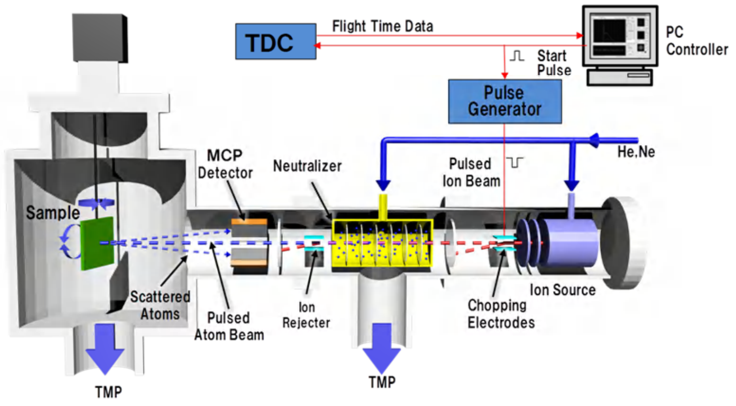


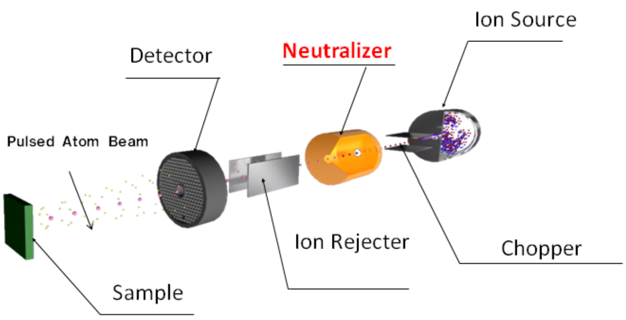
Pole Figure (Full Scan Image)



Outline

The low energy ion scattering spectroscopy (LEIS) is a powerful method for surface crystal structure and elemental composition analysis of the topmost several layers of the crystal surface. However, analyses of insulator surfaces have been very difficult because of the electric charge-up caused by positive ions. To overcome the difficulties of charge up effects on insulator surfaces, we have developed a new type of surface instrument, TOFLAS-3000(Time Of Flight Low energy Atom Scattering spectroscopy).





Elemental and structural analysis of a crystal surface can be made by the time of flight techniques, because energy and frequency of scattered atoms depend on the mass and the density of the target atom in/on the crystal surface.

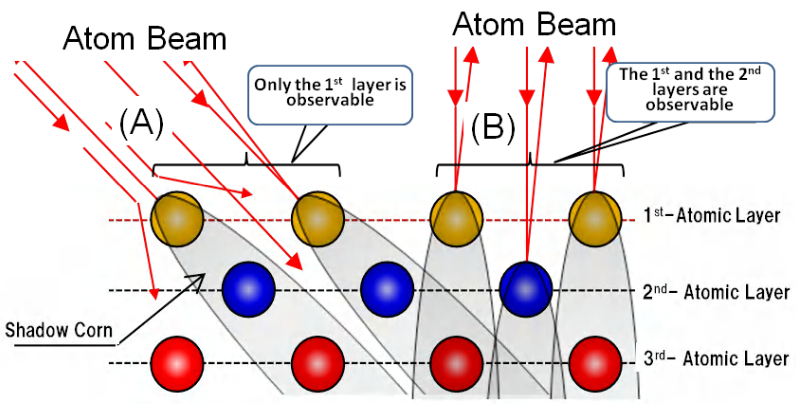
When the atoms in the second and the third atomic layers are covered by the shadow corn of the first atomic layer as shown in the left (A), the atoms only in the first atomic layer can be detected.

In case of (B), the first and the second layer's atoms are detected. Thus, the crystal structure of the surface can be analyzed by examining the incident angle dependence of the scattered intensity at desired flight time.

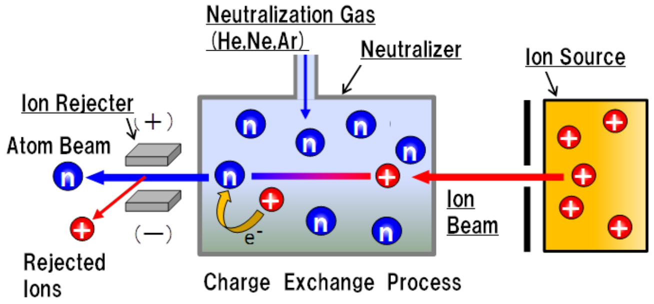
TOFLAS-3000 is composed of ionization source, neutralization room (converting ions to atoms), micro-channel plate (MCP) detector and main analysis vacuum chamber.

The ions generated in the ionization source are accelerated and chopped into a pulsed beam. The pulsed beam is neutralized in the neutralization room and transformed into neutral (atom) beam.

The atom beam hitting the sample surface is scattered all the directions. Only backward-scattered atoms are detected by MCP detector, the energy and frequency of detected atoms are measured by time of flight (TOF) analysis.



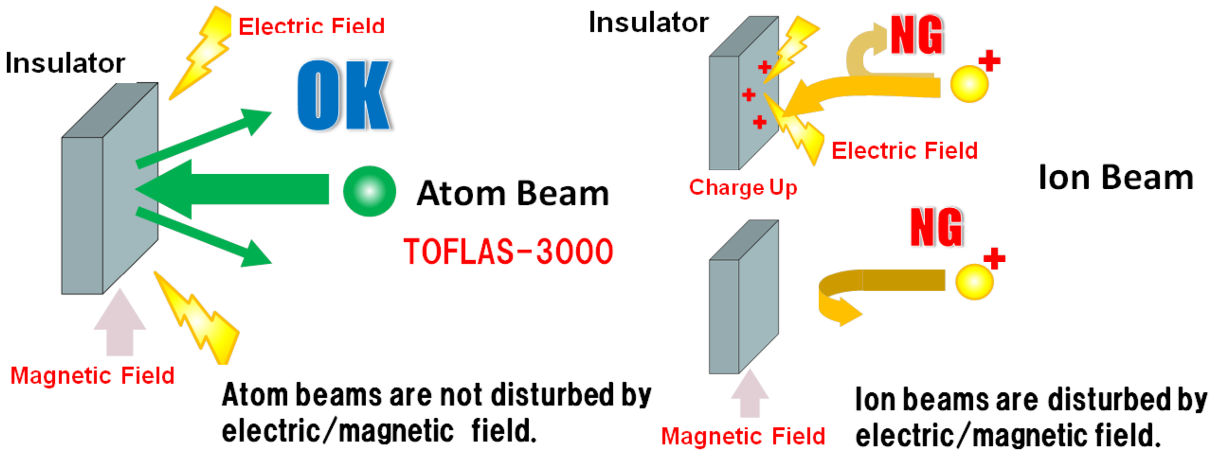
Principle of neutralization

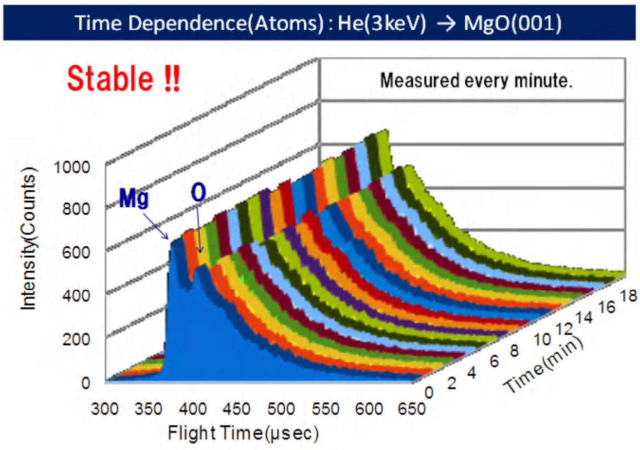


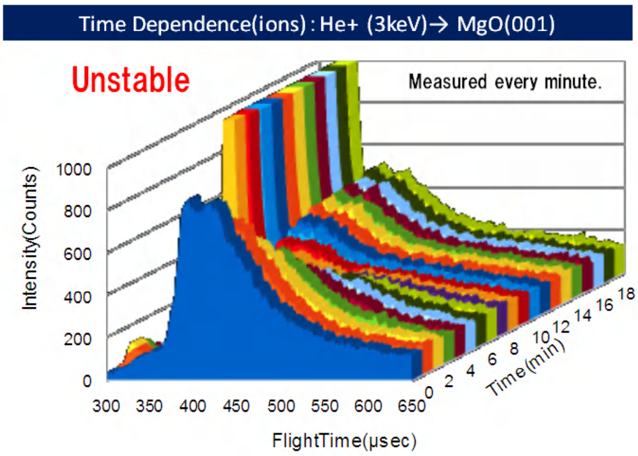
The ion beam is neutralized by the charge-exchange reaction by the light collision with surrounding neutral gas atoms when the ion beam passes through a neutralizer.

Atom beams make it possible to reveal insulator surface Structures

1. Surface analysis for not only metals/semiconductors but also insulators.
2. In-situ analysis in a strong electric/magnetic field is also possible.
3. Possible to analyze the sample with electrically floating condition.



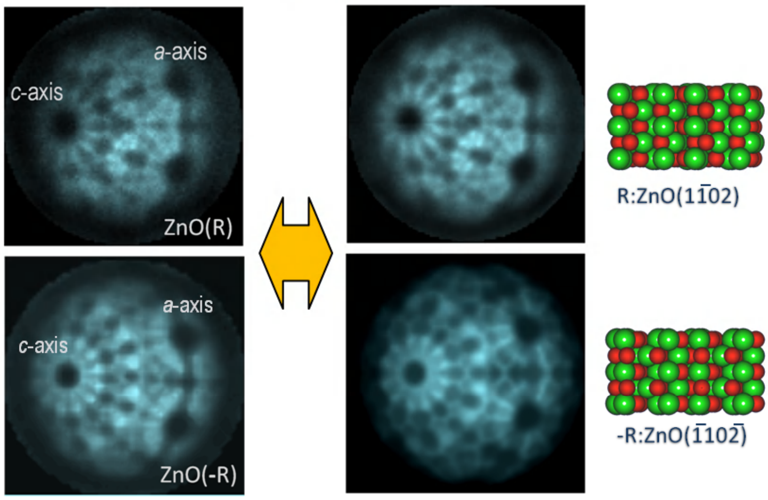




Applications

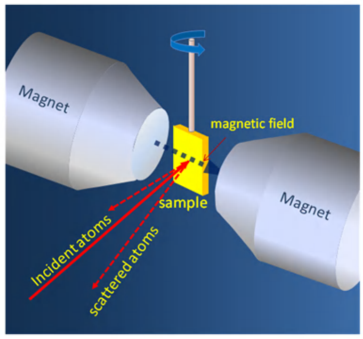
① Structure analysis of surface layers
② Pole figure analysis of a polar surface
③ Single-atomic-layer growth monitor
④ Analysis of surface segregation
⑤ Criteria of crystal growth modes
⑥ In-situ analysis in electric/magnetic field

Assessment of Polarity (Pole Figure Analysis)



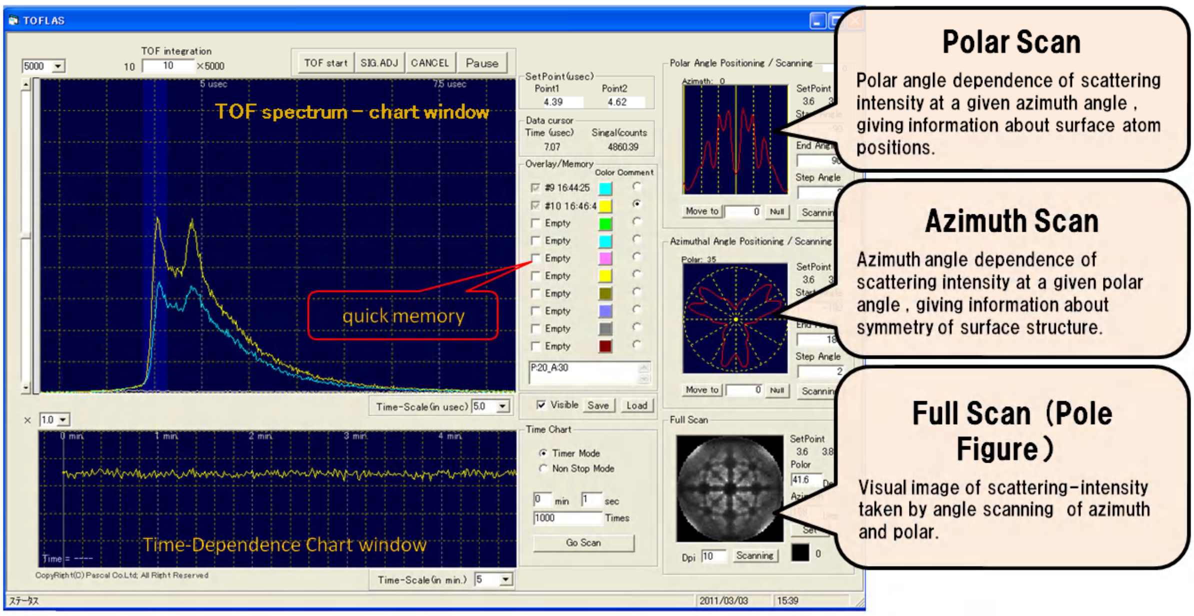
Observed Pattern   Simulated Pattern

In-situ analysis in a magnetic field



Atom beams are not disturbed by electric and magnetic field

Monitoring Screen



PASCAL CO., LTD

Pascal Co., Ltd.

HEAD-OFFICE: 1-16-4 SYOWA-CHO, ABENO-KU, OSAKA 545-0011,JAPAN
PHONE:+81-06-6626-1321 FAX:+81-06-6626-1323

URL: http://www.pascal-co-ltd.co.jp
e-mail : pascal@pascal-co-ltd.co.jp

Pascal co.ltd. holds the non-exclusive licenses for atom scattering spectroscopy under the agreement with Osaka Prefecture University, Japan .