

BIP-KV100 Ionization Energy Measurement System



It is very critical and important to measure ionization energy and work function of the organic semiconductor materials such as organic electronic luminescence and organic thin film solar cells.

Generally, measurement of ionization energy/work function has been done by photoelectron spectroscopy such as UPS and XPS in which the samples have been measured only under high vacuum atmosphere. However, organic devices are affected by the atmosphere so that measurement under various atmospheric gas have been demanded.

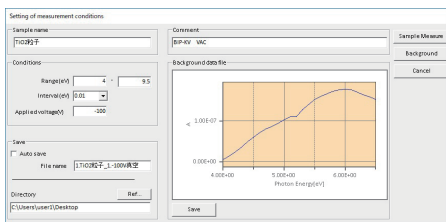
By employing Photoelectron Yield Spectroscopy(PYS), Model BIP-KV100 is capable to measure such samples under nitrogen atmosphere, vacuum atmosphere, and atmosphere. Using a nitrogen purge type monochromator and optical system, Model BIP-KV100 is capable to irradiate vacuum ultra violet light up to 9.54eV to the samples.

- Background measurement and sample measurement can be continuously performed by the sample slide mechanism. Measurement is possible with the preset atmosphere (atmosphere, nitrogen, vacuum) maintained.
- Ultrahigh sensitivity of 13 digits (10 fA ~ 100 mA) has been achieved with use of PYS method.
- A port mounting a commercially available dry vacuum pump and composite molecular pump is provided
- The optional Measurement Range Extension Unit enables the system to measure from 3.4 eV.

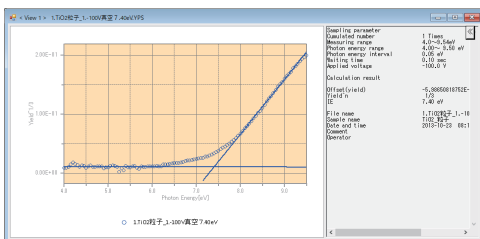


Measurement Data

Screen of Measurement Conditions



Ionization energy measurement data of TiO₂ particles [7.4 eV]



Measurement Items

① Background measurement:

The light to be irradiated on the sample is measured in advance with a photomultiplier, and the number of photons is calculated.

② Sample measurement

Monochromatic light at each wavelength is irradiated to the sample while the voltage is applied to the sample for the electrons to be released easily.

③ Ionization energy data processing

$$Y \propto (h\nu - I)n$$

Y = Released numbers of electron measured / numbers of photon irradiated

h Planck's constant

ν Frequency

I Threshold

n depends on density of electrons in the high level edge in the occupied state of the sample. Only 2 or 3 can be selected in the parameter n.



Specifications

Measurement principle	Photoelectron Yield Spectroscopy (PYS method)
Measurement WL range	9.54 ~ 4.0eV (130 ~ 310nm)
Min. measurement interval	0.01eV
Measurement resolution	10fA ~ 100mA
Sample chamber	Atmosphere, nitrogen, vacuum compatible/VG65.NW25 port for vacuum pump
Irradiation light area	approx. 1 × 3mm (by slit and vertical aperture)
WL resolution (WL width)	0.08eV (4.2nm) * at 256nm
Sample arrangement	Horizontal, Number of setting sample: 1 pc
Sample size	Max. 60 x 60mm, Min. 10 x 10mm, Thickness : within 4mm
Door switch	For safety of Internal applied voltage electrode and for applied voltage for PMT
Monochromator structure	Nitrogen purge (light source and high order light cut-filters built in)
WL drive	Stepping motor, sine bar method (GPIB control)
Focal length	100mm * for monochromator
Aperture ratio	F=3.5 * for monochromator
Mechanical WL range	0 ~ 400nm * In case of the grating 2400 lines/mm
WL accuracy	± 1nm * Setting from long WL *WL accuracy & repeatability
Tubing introduction	IN2 (Swagelok 1/4), OUT2 (Swagelok 3/8), Relief valve, Flow meter, Stop valve
PY measuring device	Micro ammeter (Sub-Femtoamp Remote SourceMeter) *PY=Photoelectron Yield
Irradiation intensity detector	PMT (supplied with certified spectral sensitivity data for 130 ~ 310nm)
Software control function	System control, photoelectron measuring function, cal. of ionization energy (work function), DOS
Software save function	Data binary save and redisplay function, save in text



Standard configurations

- Deuterium lamp 30W, (MgF2 window, natural air cooling)
- Power supply for D2 lamp
- Nitrogen purge type monochromator
- Grating: 2400 grooves/mm blazed at 150nm (MgF2 coating type)
- High order light cut filters and shutter
- Flow meter (1 ~ 10L/min)
- Sample chamber (atmosphere, nitrogen atmosphere, and vacuum compatible)
- Sample stage: 62 x 62mm (PTFE, detachable)
- Sample stage slide mechanism (operated outside of sample chamber, travel distance 65mm)
- Plate electrode up-down mechanism (travel distance 6mm)
- Standard sample (Gold leaf Au)
- PMT for measuring irradiation light intensity and high voltage power supply (applied voltage -300V)
- Minute current measurement device for Photoelectron yield measurement
 - Minimum range: 1pA Minimum range resolution: 10aA (when the range is set at 1pA)
 - Max. range : 100mA Max. range resolution: 1.0 μA (when range is set at 100mA)
 - Noise level: within 0.4 fAp-p (4 × 10⁻¹⁶ A noise)
- Controller (GPIB control)
- GPIB-USB cable
- Software (Windows 10 compatible, English)
- PC for controlling the system Note PC Windows 10 64bit



Option

- Measurement range expansion unit (for 3.4 ~ 7.5eV)
 - Grating 2400 grooves/mm blazed at 240nm (MgF2 coating type)
 - PMT (for 3.4 ~ 7.5eV)
- Automatic sequencer (Vacuum drawing, vacuum leak, nitrogen purge)
- Vacuum pump (Multi steps root motor type dry vacuum pump/ Turbo Molecular Pump)



Utility

- Power supply : AC100V-220V
- Nitrogen: Regarding purity, 99.999% or more is recommended
Introduction pressure 0.1 ~ 0.4MPa
Ordinary use flow rate : Approx. 3~5NL/min
Nitrogen IN fitting: Swegelok 1/4 2 places
Nitrogen OUT fitting: Swegelok 3/8 2 places
- Main unit : approx. W660 x D460 x H500mm * excluding the protrusion part
approx. W710 x D550 x H600mm * excluding the protrusion part
- Weight : approx. 80kg

● The specifications, appearance and technical information described in this catalog are subject to change without prior notice.

< BIP-KV100-1710048E >

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