“MICROSCAN–M”
SCANNING ELLIPSOMETER OF HIGH SPATIAL AND TIME RESOLUTION

Description
“MICROSCAN–M” ellipsometer is intended for measuring surface optical parameters of microobjects and studying surface microstructures with high temporal resolution. The instrument operation is based on measuring the polarization state of light reflected from a sample surface with subsequent determination of optical characteristics of surface and film structures.

Specifications
The ellipsometer allows:
- measuring surface optical parameters of microobjects and microstructures with spatial resolution of 5 μm;
- monitoring surface optical parameter variations of microobjects with temporal resolution of 1 microsecond;
- measuring optical parameters distribution over a 150 × 150 mm-sized sample area;
- measuring thin-film layer thickness with an accuracy of several angstrom;
- measuring layer refractive index and absorption coefficient within an accuracy of 0.001.

The instrument appearance

Technical appraisal and economic benefits
“MICROSCAN–M” ellipsometer offers clear advantages over the best foreign analogs in technical and cost-competitive characteristics. These are presented in comparison in the Table below.
<table>
<thead>
<tr>
<th>No.</th>
<th>Specifications</th>
<th>MICROSCAN-M</th>
<th>RUDOLPH USA AutoELL II</th>
<th>Gaertner USA L115S</th>
<th>SENTECH Germany SE400</th>
<th>PHILIPS Netherlands SD2300</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Measurement accuracy:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- film thickness</td>
<td>± 3 Å</td>
<td>± 3-10 Å</td>
<td>± 8 Å</td>
<td>± 5 Å</td>
<td>± 5 Å</td>
</tr>
<tr>
<td></td>
<td>- refractive index</td>
<td>± 0.005</td>
<td>± 0.01</td>
<td>± 0.01</td>
<td>± 0.005</td>
<td>± 0.005</td>
</tr>
<tr>
<td>2.</td>
<td>Time of single measurement, minimal (msec)</td>
<td>0.001</td>
<td>12000</td>
<td>100</td>
<td>250</td>
<td>1000</td>
</tr>
<tr>
<td>3.</td>
<td>Spatial resolution (μm)</td>
<td>5</td>
<td>25</td>
<td>15</td>
<td>50</td>
<td>10</td>
</tr>
<tr>
<td>4.</td>
<td>Scanning area (mm)</td>
<td>150×150</td>
<td>152 × 152</td>
<td>300 × 300</td>
<td>150 × 150</td>
<td>200 × 200</td>
</tr>
<tr>
<td>5.</td>
<td>Basic kit price (USD)</td>
<td>45 000</td>
<td>110 000</td>
<td>95 000</td>
<td>120 000</td>
<td>98 000</td>
</tr>
</tbody>
</table>

Usage of the instrument enables to extend a production yield by 30 to 70 %.

**Application areas**

The scanning ellipsometer of high spatial and temporal resolution “MICROSCAN–M” is widely applied for unique studies in various fields of modern science and engineering, such as:

- **semiconductor physics:**
  - measurement of optical parameters of semiconductor materials including synthesized semiconductor quantum-dimensional structures (superlattices, quantum dots, etc.);
  - investigation of physical characteristics of micro- and nano-scaled thin film structures: optical constants, composition, crystal perfection, mechanical stress and layer thickness;
  - study of interfaces, surface adsorption-desorption processes on semiconductor structures;
  - research into implanted semiconductor layers: defect formation, crystallization, formation of semiconductor nanostructures;
  - investigation of surface under plasmochemical treatment;
  - diagnostics of atomically clean semiconductor surface;
  - mapping of optical properties of samples under study.

- **optics:**
  - investigation of optical properties of materials, piezo-, electro-, magnetooptical effects;
  - examination of anisotropic properties of crystals and coating films in crystal optics;
  - study of objects of multiplayer and gradient optics.

- **electrochemistry:**
  - exploration of metal corrosion processes;
  - investigation of initial stages of nucleation upon electrolyses;
  - study of anodic oxide growth-dissolution processes. (Furthermore, ellipsometry is a unique method providing opportunity to carry out investigations during on-going electrochemical reactions).

- **organic chemistry:**
  - investigation of structural properties and optical characteristics of polymer films including Langmuir-Blodgett ones;
  - study of interfacial organic molecules adsorption.

- **biology and medicine:**
  - study of protein adsorption processes and immunologic responses;
  - analysis of blood coagulability;
  - study of cell structures;
- investigation of eye retina.
- other fields: geology, meteorology, crimilalistics, in studying properties of novel materials and their treatment technology.

**Development stage**
Prototype.

**Patent situation**
RF patent issued in 2001.

**Commercial offers**
Joint production. Contract for production and supply.

**Estimated cost**
1350 thousand roubles.

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