

Hybrid (electronic – x-ray) nanomicroscope (HNOM–40) for nanotechnology.

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Hybrid (electronic – x-ray) nanomicroscope (HNOM–40) [1, 2, 3] is an electron-probe device that combines electronic and x-ray microscopy (Fig. 1). It is intended for complex diagnostics and control of nanostructured objects size of which is about few millimeters.

The microscope utilize tungsten thermionic cathode operating under accelerating potential 1-40kV. HNOM-40 has following modes and parameters:

№	Name of mode	Conditions	Max. resolution (nm)
1.	Scanning mode in secondary electrons	vacuum	2-3
2.	Scanning mode in transmission electrons	vacuum	1-2
3.	Scanning mode in elastically scattered electrons	vacuum/air	10
4.	Projection x–ray mode	vacuum/air	20-30
5.	Scanning x–ray mode	vacuum/air	50

Main parts of the microscope are a table electron-probe unit and two supply and control units. The electron-probe unit (Fig. 2) consist of a column (system of electromagnetic focusing lenses for electron beam and electron gun), elements of vacuum system, detectors, changeable cameras and sample stages, which are made in compliance with sizes of samples and character of research. Supply units places separately from electron-probe unit that provides access to the module for easier connection to additional detectors and devices. Probe and optic microscopes, x-ray analyzers and other components can be included in microscope (Fig. 3). The x-ray analysis of the object can be made in the ordinary x-ray radiance of target and by registration of x-ray which was a result of driving thin vacuum-tight substrate (membrane) by an electron beam (the object is used as a target) as well. HNOM-40 allows to analyse surface and examine internal structure in different modes. X-ray source make it possible to explore samples without any destruction and advance preparation in the air or in liquid phase. For realisation of limit resolution in x-ray mode an ultra-thin target substrate is used which provides micron distances, object focus (target) and high zooms.

There exist several modifications of microscope. They allow to solve specific research tasks, production control, as well as training specialists. HNOM-40 has simple construction, small size, low cost and maximum parameters in all modes.

References

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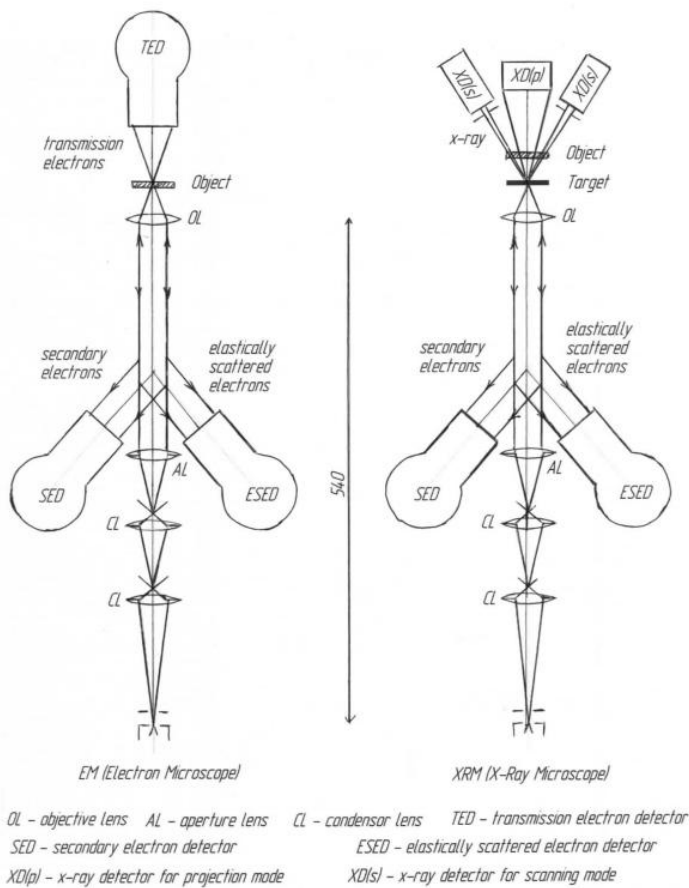


Fig. 2. Electron-probe unit of experimental model.

Fig. 1. Scheme combining SEM and XRM.

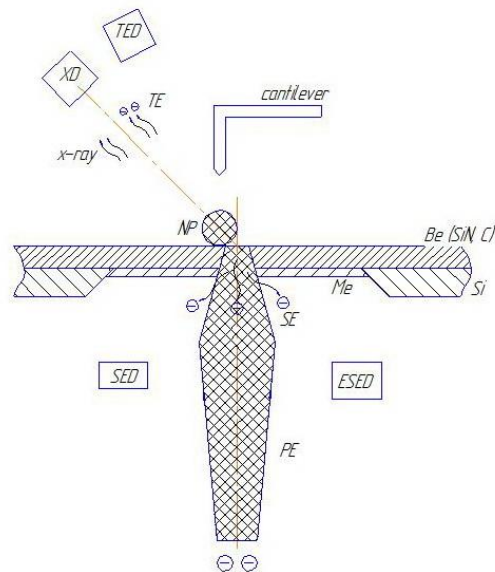


Fig. 3. Scheme combining of electron, x-ray and probe microscopes. (NP – nanoparticle, TE – transmission electron, SE – secondary electron, PE – primary electron, XD – x-ray detector, TED – transmission electron detector, SED – secondary electron detector, ESED – elastically scattered electron detector).