

Development of an electron gun operated at intermediate-high energies for electron energy-loss spectrometer

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Synopsis A new electron gun operated at intermediate-high energies for electron energy-loss spectrometer has been developed, which can emit the electron beam with beam size of 0.95 mm, divergence angle of 0.93degree, and beam current of 6.27 μA at 27 mm from the exit of electron gun a beam energy of 1.5 keV.

The electron energy-loss spectroscopy is a kind of important tool for material analysis, which is based on the inelastic scattering processes between electron and sample to obtain the information of electron structure in matter [1, 2]. It has been applied to the investigation of electron structure and dynamics of atoms and molecules, physical and chemical properties of solid material surface, and catalytic science, etc [2]. For low-energy electron impact, the pure electron structure information of target molecules can not be obtained due to the distortion effect on wave function by the incident electron. On the other hand, high-resolution spatial information of target sample can not be induced [1, 2].

Here a new electron gun for electron-energy loss spectrometer in intermediate-high energy region has been developed. To obtain the optimal beam condition, the electron optics software SIMION [3] was utilized to simulate the space size and divergence angle of the electron beam at target position. The electron gun has a simple structure, i.e., consisting of thermionic cathode, grid electrode, anode electrode, focus electrode and deflection plates. The tuning range of electron energy is wide (1-3

keV) and easy to operate. The electron beam with beam size of 0.95 mm, divergence angel of 0.93° , and beam current of 6.27 μA was performed at 27 mm from the exit of electron gun at a beam energy of 1.5 keV.

Figure 1 shows the structure of the electron gun, along with denotes for the individual parts.

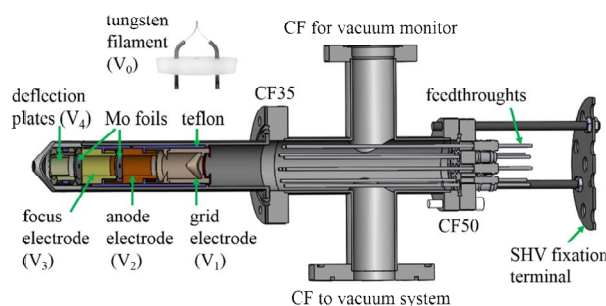


Figure 1. Structure of the electron gun.

References

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