Structural analysis and design on energy calibration and resolution measuring device of beamline station

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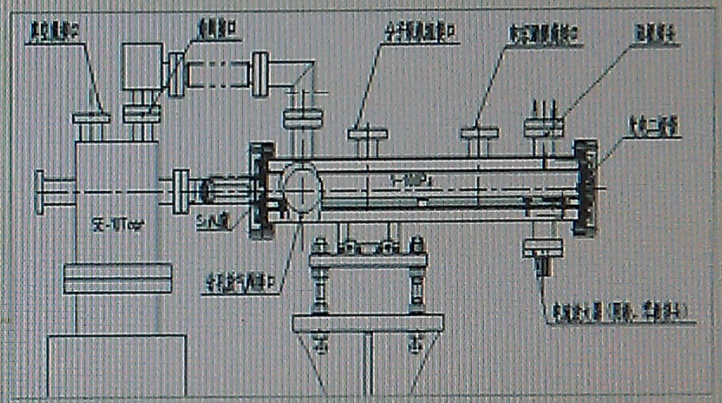
The soft X-ray spectroscopy microscopy beamline station is used in the research fields of materials, environment, biology, organic geochemistry and meteorite. In this paper, energy calibration and resolution measuring device of the beamline station is designed and analyzed. Through analyzing, the device is located between the slit and the zone plate lens (ZP), and the soft X-ray energy range is 250eV ~ 2000eV. The device includes vacuum chamber, ionization chamber support, anode, cathode, two zero-pole, vacuum piping, pneumatic valve, angle valve, pinhole flow meter, Si_3N_4 windows, photodiode, current amplifier, capacitor film and molecular pump unit. Off-line vacuum chamber with two chambers is used to design the ionization chamber. When working, it is installed in the beamline, and testing gas is put into the ionization. When the work is done, it is disassembled. Ionization chamber support must be with three-dimensional adjusting function, and its adjusting resolution is 0.2mm. The center of Si_3N_4 windows must be located on the optical axis when the ionization chamber is installed, and the horizontal error and vertical error are both less than 0.1mm.

The testing result of energy resolution is better than 10000 under the conditons of beam current160mA, gap 55.63mm, ionization chamber pressure 2×10^{-3} Torr, voltage 28V, and working gas Ar. The luminous flux of sample is better than 108photons/sce/200mA at positions of $50\times 50um^2$ and $70\times 70um^2$ tested by the photodiode in the ionization chamber. The testing result meets the requirement. The device has been used in the beam line experimental station, and its performance is stable and reliable.



Blue print of measuring device

Photo of measuring device