VI-N Study on RF-Photocathode for Compact X-Ray Sources

Electron storage rings are useful and practical devices as x-ray sources because which produce a number of photons owing to high electron current and various insertion devices. However, these synchrotron radiation facilities usually occupy large area and cost much. So that there have been many works to investigate more compact x-ray sources such as x-ray lasers and free electron lasers. It is also useful to use laser undulator radiation or backward Compton scattering caused by the interactions of electron beams with laser photons, if we provide enough electrons to produce practical intensity of x-rays. RF-photocathode would produce dense electron beam so that it is a useful candidate of a electron source. It is necessary to search good materials as the photocathode for construction of a practical compact x-ray source. Cesium telluride has reported to have a good quantum efficiency, so that we have been studied about it.

VI-N-1 Preliminary Study on Photoemission from Cesium Telluride Irradiated by Polarized Photon

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Cesium telluride is a good candidate for a material to be used as a photocathode for RF-gun because of its high quantum efficiency and long life. The quantum efficiency of the photocathode for polarized photon measured with changing the incident angle of the light gives us important information about the optical constants of the materials of the photocathode.

We preliminary measured the quantum efficiency of cesium telluride by using linear polarized photon. Figure 1 shows a sketch of our experimental set up. A Xe lamp was used as a light source. The light from the Xe lamp passed through a monochrometer and a polarizer then enter a vacuum chamber in which cesium telluride was evaporated on molybdenum block as a photocathode. The incident angle of the light was 60°. We rotated the polarizer in order to change the direction of polarization. Figure 2 shows the quantum efficiency for the incident light of 250nm wavelength with changing the direction of polarization. The quantum efficiency has peaks at 90° and 270°. The direction of polarization was parallel to the reflection plane at these angles.

For the further study, we should change the incident angle of the light and measure the quantum efficiency in order to obtain the information of optical constant of cesium telluride.

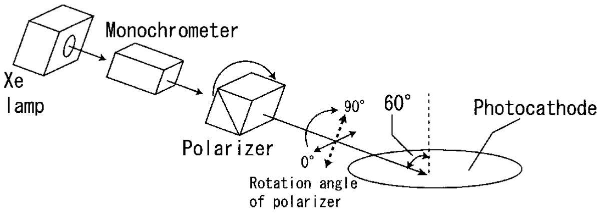

Figure 1. Sketch of experimental set up.

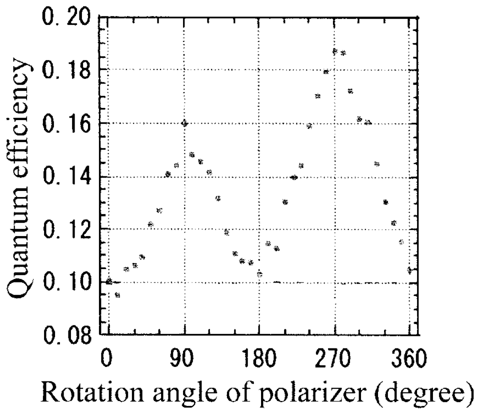

Figure 2. Quantum efficiency of cesium telluride with rotation angle of polarizer for incident light of 250 nm.