Master the method to increase quantum efficiency of a microchannel plate (MCP)

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The main constituent particles in the Earth's plasmasphere are H+, He+, and O+. Since the latter half of the 90's, taking picture of the Earth's plasmasphere has become possible by a new observational method, which collects He+ resonance-scattering light outside the plasmasphere. The method has a great advantage that the time and spatial changes of the plasmasphere are distinguished each other. Therefore, two dimensional images have contributed to our understandings of the plasmasphere's dynamics, for example, how does the plasmaspheric structure make up? and how does the plasmasphere response to the fluctuation of the solar wind?

He+ has the resonance-scattering line at 30.4nm, that is in the range of extreme ultraviolet (EUV: 20nm-150nm). The brightness of the plasmaspheric EUV radiation is so low that any detector cannot pick up the signals with high efficiency. For example, microchannel plates (MCPs), which are commonly used for EUV observations in space, have a quantum efficiency by 1-10%.

Depositing a photoelectric material on the surface of the first MCP has is one of the most widely used approach to increase the quantum efficiency. Cesium iodide (CsI) and barium bromide (KBr) are the typical photoelectric materials to be chosen.

However, not all experimentalists believe that the approach is really effective.

Scientists involved in the IMAGE mission (NASA) replaced a CsI-deposited MCP to a bare MCP immediately before the launch, because photoelectric materials do not increase the quantum efficiency.

Thus, it is not clear whether the approach is effective or not.

We deposited CsI and KBr on the surface, and measured the quantum efficiency to confirm the effectiveness of the photocathodes. In this paper, we will present the result and feasibility.