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Progress of the Capillary Plate-based Gaseous Detector for high energy photon imaging.

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A Micro-patterned gaseous detector (MPGD) is one of the most attractive and useful detector in various field. A Hole-type MPGD with glass capillary plate (CP) is the most promising detector to provide two-dimensional imaging capability with a good position resolution and highly reliable to discharge. CP gaseous detectors have been intensively studied for the purposes of X-ray radiography, cosmic X-ray polarimetry, cold neutron imaging and photosensor sensitive to light ranging from vacuum ultraviolet to visible wavelength. The CP gas detectors can be expected ideal two-dimensional imaging system combined with amplified charges and scintillation light emitted from each hole upon gas excitation. For the realization of the imaging capability, we describe the operation properties and some of the characteristics of the CP with diameter less than 50 μ m.

The plate consists of a bundle of fine capillaries with diameter 25 μ m and a uniform length of 0.2mm. The electrodes on the surface of both ends of CP were coated with metals. Because CP is made of glass material with proven vacuum tubes components such as PMT and Image Intensifier and possible to fabricate a large size substrate beyond 100mm square, it is also suitable for the fabrication of the sealed gaseous detectors.

A basic performance test of the CP gaseous detector was carried out with a gas mixture of Ne (90%) + CF₄ (10%). We successfully obtained a gas gain of over 1000, and we have been studying the energy resolution and imaging capability using X-rays.

This result indicates that CP is possible to improve both the detection efficiency and imaging quality. By designing the shape of the CP, we are considering the improvement of the charge collection efficiency and charge extraction efficiency of the amplification region.

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