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Precision fabrication of large area silicon-based geometrically enhanced x-ray photocathodes using plasma etching

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Abstract References

abstract

Geometrically enhanced photocathodes are currently being developed for use in applications that seek to improve detector efficiency in the visible to X-ray ranges. Various photocathode surface geometries are typically chosen based on the detector operational wavelength region, along with requirements such as spatial resolution, temporal resolution and dynamic range. Recently, a structure has been identified for possible use in the X-ray region. This anisotropic high aspect ratio structure has been produced in silicon using inductively coupled plasma (ICP) etching technology. The process is specifically developed with respect to the pattern density and geometry of the photocathode chip to achieve the desired sidewall profile angle. The tapered sidewall profile angle precision has been demonstrated to be within ± 2.5° for a ~ 12° wall angle, with feature sizes that range between 4-9 μm in diameter and 10-25 μm depth. Here we discuss the device applications, design and present the method used to produce a set of geometrically enhanced high yield X-ray photocathodes in silicon.

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