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## 11. An SU-8 Delayed Development Processing Technology for MPGD

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SU-8 is a high-contrast, epoxy-based photoresist designed for micromachining and other microelectronic applications where a thick, chemically, and thermally stable image is desired.  $\mu$ Groove is a high-performance single-stage MPGD featuring a groove amplification pattern, typically fabricated by chemical etching. In this study, we present the process of  $\mu$ Groove with smaller amplification units on a quartz substrate using SU-8. Specifically, SU-8 served as a sacrificial layer, and an Al film acted as a supporting layer. During the exposure of the positive photoresist, the negative photoresist SU-8 was also exposed synchronously without any positional offset. Finally, through delayed development of SU-8, we achieved self-alignment of the cathode metal layer (aluminum) and the SU-8 supporting layer, completing the prototype with a groove pitch of  $140\mu\text{m}$ , a width of  $70\mu\text{m}$ , a thickness of  $50\mu\text{m}$  for SU8 and  $100\text{nm}$  for Al. When read from the cathode, the effective gain of the induced signal can reach up to 1600, with an energy resolution of approximately 9.5%. By fixing the detector voltage at 370V and scanning the drift electrode, the gain increases almost linearly with the drift electrode voltage, with the energy resolution also around 12%. Based on the delayed development technology of SU-8, we also explored some MPGD structures, such as Micromegas and  $\mu$ RGroove on PCB. Due to the high precision of the SU-8 photolithography process, it is possible to fabricate microstructures with smaller granularity and effectively bond them with readout chips, showing potential in the field of ultra-high precision detection.

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