# An SU-8 Delayed Development Processing Technology for MPGD

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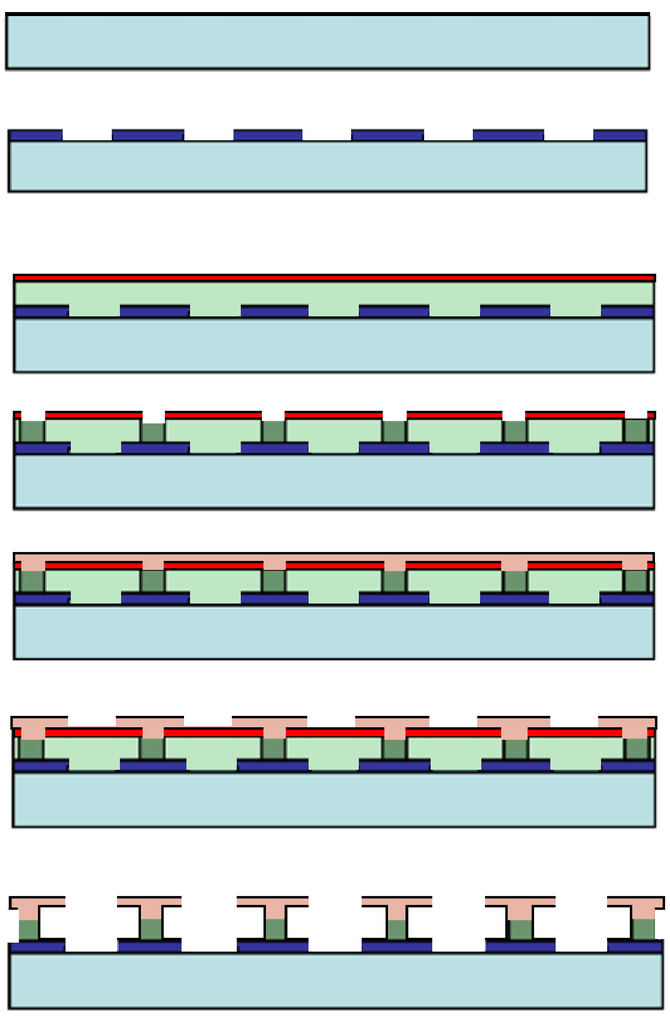
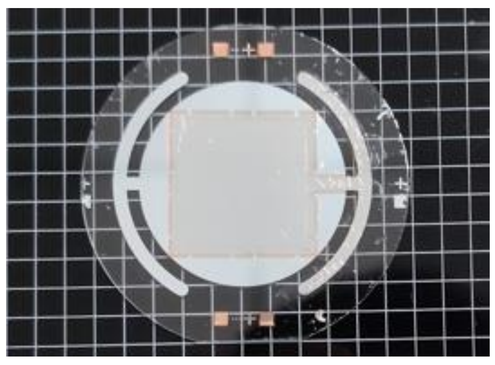
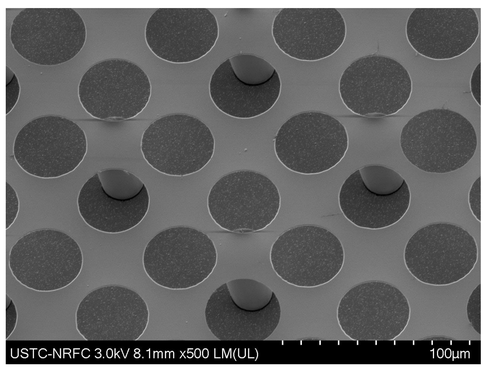
**SU-8 is a high-contrast, epoxy-based photoresist specifically designed for micromachining and other microelectronic applications that require a thick, chemically, and thermally stable image. Its excellent adhesion and chemical resistance ensure reliable performance in high-energy physics experiments, where it has been successfully implemented in GridPix detectors. In this study, we present an electrically and mechanically robust amplification structure — μRGroove which is made by the delayed development technology based on SU-8. Combining with the existing ASIC technology, the SU-8 μRGroove can be a potential candidate for the future applications on X-ray polarization measurement.**

## SU-8 Micromegas (InGrid) on Quartz

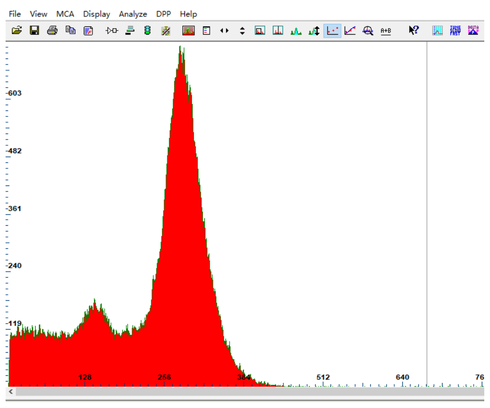


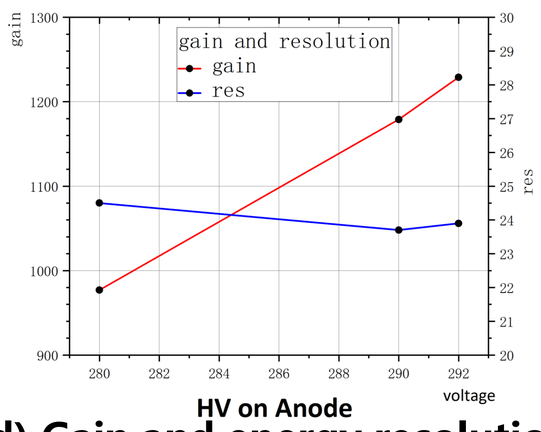
a) InGrid on quartz




b) Top View of InGrid




c) Energy spectrum

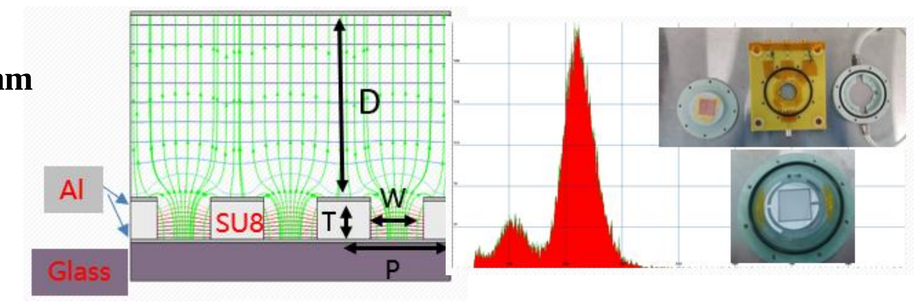



d) Gain and energy resolution

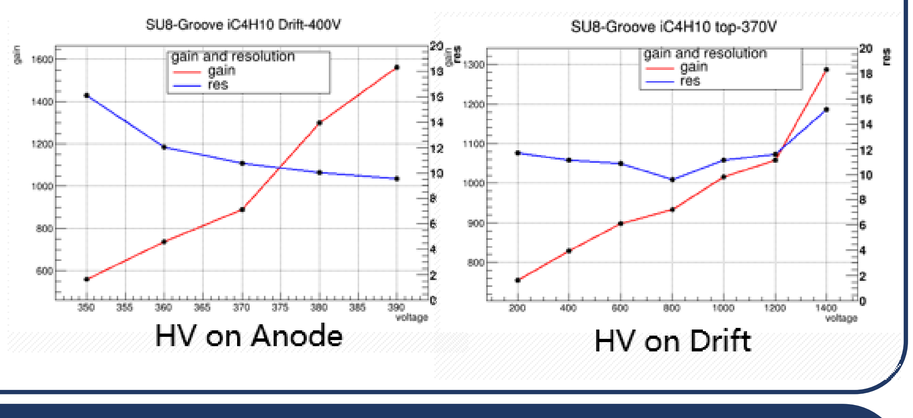
## SU-8 μGroove on Quartz

- **To demonstrate the feasibility of producing groove structures by using the similar process as InGrid**

**Drift(D): 3mm**
**Thickness(Al):~150nm**
**Thickness(T): 50μm**
**Width(W): 70μm**
**Pitch(P): 140μm**

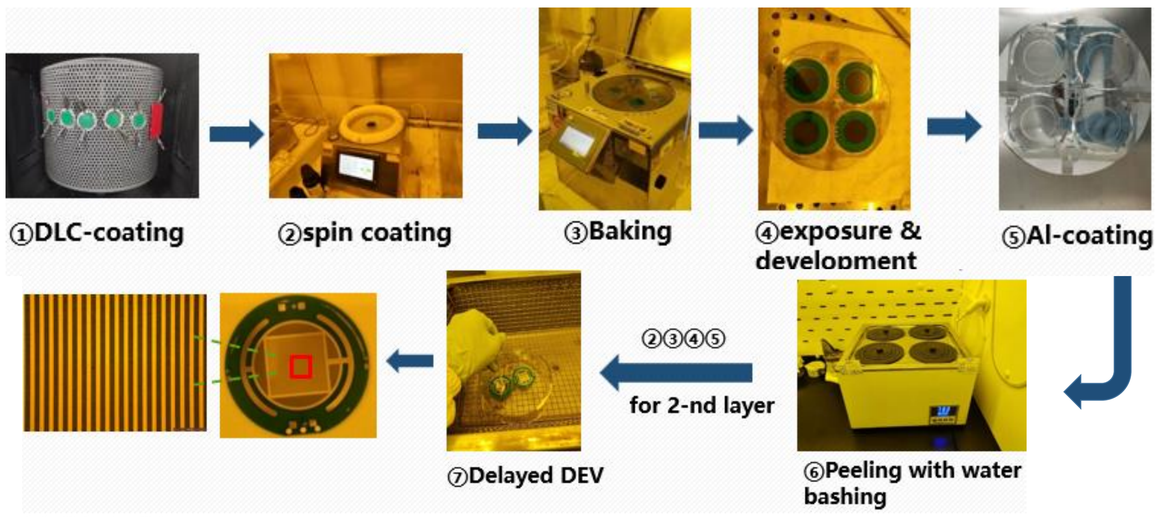


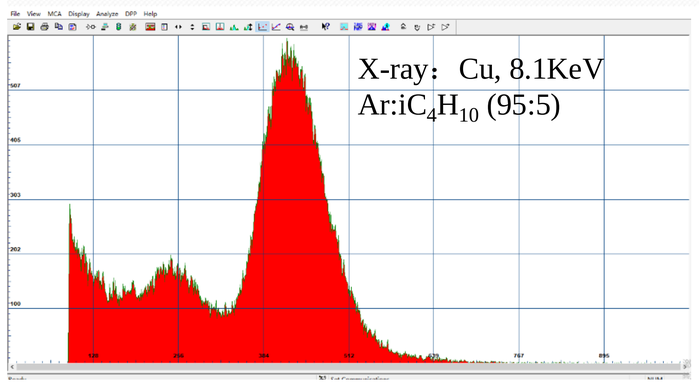

**X-ray: $^{55}$Fe, 5.9KeV**
**Ar:$iC_4H_{10}$ (95:5)**
**Gain: ~1600,**
**Resolution : ~9.5%**




## SU-8 μRGroove on PCB

- **Readily to produce the readout electrode and the insulating layer under DLC**




**Drift: -400V**
**DLC: +355V**
**Drift(D): 3mm**
**Thickness(Al): ~150nm**
**Thickness(T): 50μm**
**Width(W): 70μm**
**Pitch(P): 140μm**

- **Breakdown voltage reaches 600V in air**
- **Maximum working voltage is 355V in Ar:$iC_4H_{10}$ (95:5)**
- **Energy spectrum can be obtained, but the gain is low, ~100@355V**
- **Significant charging-up effect observed**

## Summary & Outlook

1. **We successfully produced mesh and groove structures on quartz without any resistive electrode.**
2. **We found the adhesion between the PCB substrate and SU-8 is poor, and the stress shrinkage of SU-8 on PCB is more pronounced than that on Si or quartz. Both phenomena may cause significant delamination of SU-8 during the peeling process.**
3. **We plan to produce μRGroove with PI insulating layer and DLC resistive electrode on quartz in the near future.**

*[1] Pietro Maoddi, et al. SU-8 as a Material for Microfabricated Particle Physics Detectors. Micromachines 2014, 5, 594-606;*
*[2] W. J. C. Koppert, et al. GridPix detectors: Production and beam test results. NIMA, 732 (2013) 245-249*
*[3] Y. Bilevych, et al. TwinGrid: A wafer post-processed multistage Micro Patterned Gaseous Detector. NIMA, 610 (2009) 644–648*