New Method of Linseed Oil coating for Bakelite RPC's for Heavy-ion experiments

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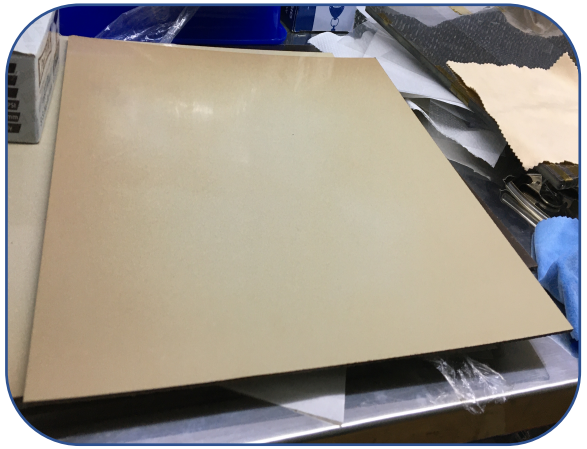
Introduction

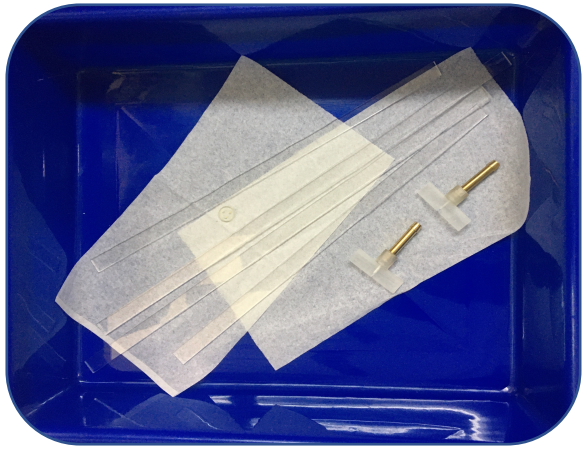
- Resistive Plate Chamber (RPC) is one of the options for triggering and tracking in High energy physics experiments because of their high efficiency, good time resolution and low cost of fabrication.
- In bakelite RPC, linseed oil coating reduces the surface UV sensitivity of the electrodes and protect it from the Hydrofluoric Acid (HF) vapor attack.
- Oil coating smoothen the electrode surface, therefore reduce the after-pulse or noise rate.
- In conventional technique oil coating is done after making the gas gap.
- In the present work oil coating is done on the inner surfaces of the bakelite electrode plates before making the gas gap.
- The advantage of this procedure is that after linseed oil coating it can be checked visually whether the curing is properly done or any uncured droplet of linseed oil is present.

Steps of Fabrication

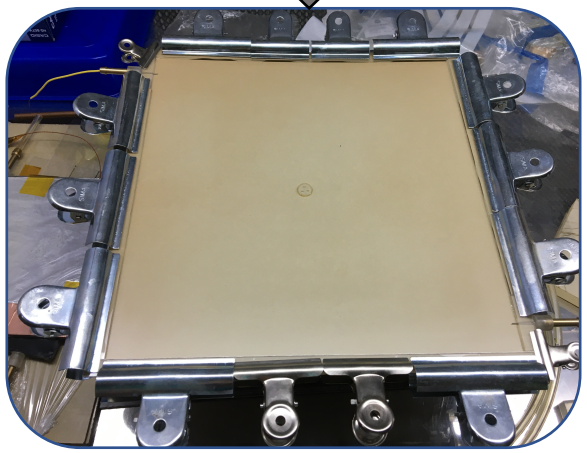
Application of linseed oil on the bakelite surface



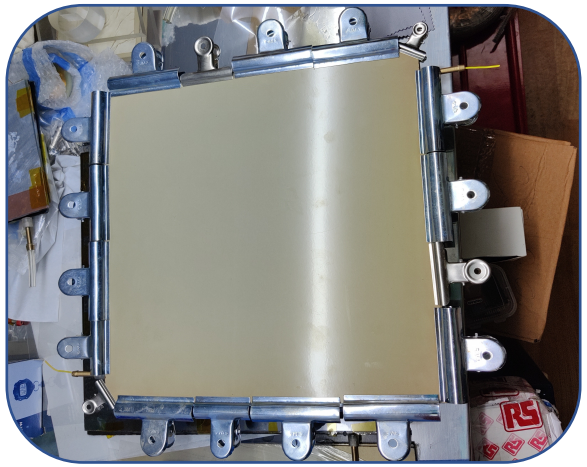
Cured linseed oil coated bakelite surface



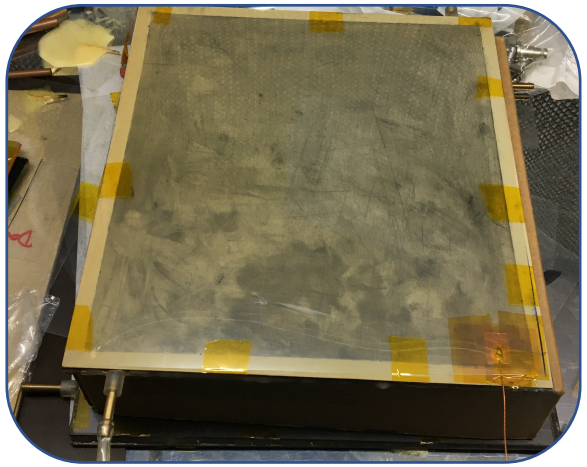
Gas nozzles and spacers



Gluing of spacers and nozzles

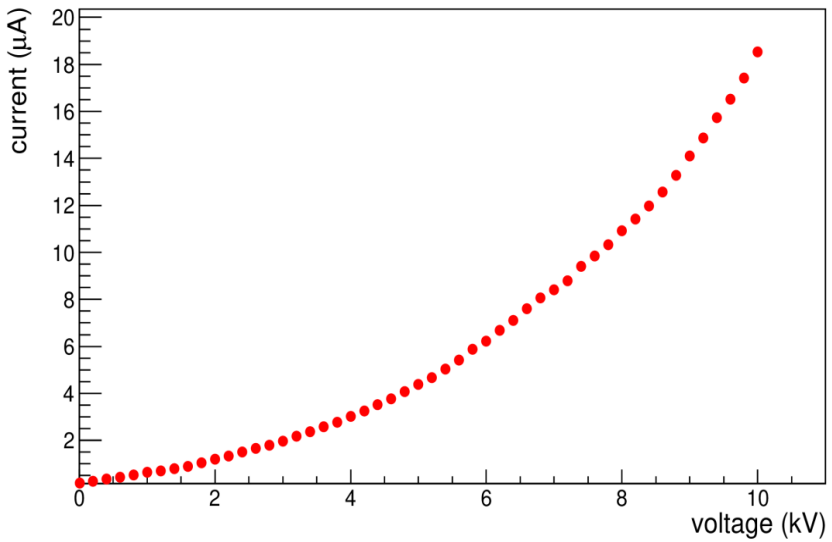


Making of gas gap



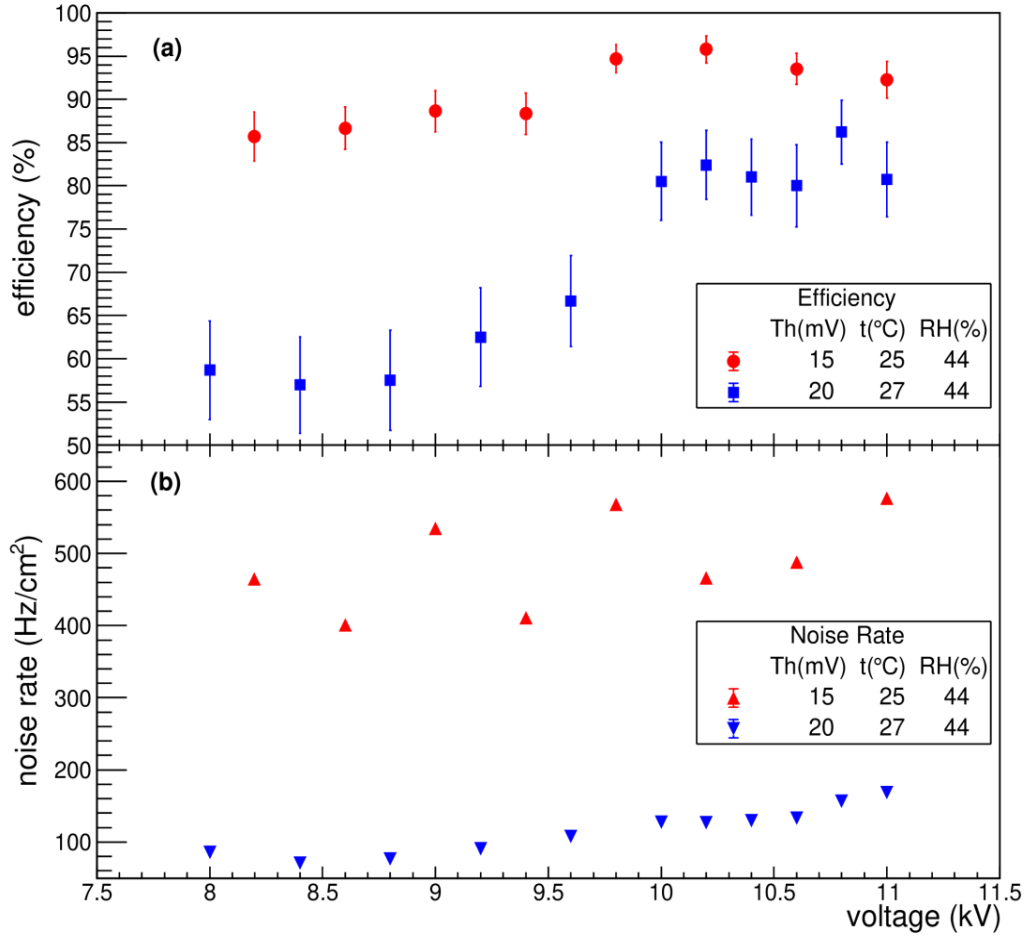
Complete RPC module after graphite coating

Results



Leakage current as a function of the applied voltage

- 100% Tetrafluoroethane ($C_2H_2F_4$) gas used in the avalanche mode.
- Efficiency plateau observed ~ 95% from 9.4 kV onwards at -15 mV threshold and ~ 85% from 10.1 kV onwards at -20 mV threshold.
- Maximum noise Rate observed ~ 500 Hz/cm^2 for -15 mV threshold and ~ 180 Hz/cm^2 for -20 mV threshold.



(a) The efficiency as a function of the voltage
(b) Noise rate as a function of the voltage

Summary

- The module is fabricated using bakelite having bulk resistivity 4×10^{10} Ω cm
- An efficiency ~ 95% from 9.4 kV onwards at -15 mV threshold and ~ 85% from 10.1 kV onward at -20 mV threshold obtained
- Maximum noise rate found to be ~ 500 Hz/cm^2 for -15 mV threshold and ~ 180 Hz/cm^2 for -20 mV threshold
- **Leakage current is found to be very similar to the RPCs build with conventional way.**
- **Noise rate is found to be very high for such a small prototype chamber.**

Outlook

- **Measurement of timing properties and long-term stability test**
- **Fabrication and testing of detectors with larger size**
- **Measurement of rate capability with accelerator**

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Thank You