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

Department of Physics, Bose Institute, Kolkata-700091, INDIA
*Email: arindam@jcbose.ac.in, arindamsen95@gmail.com
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

Complete RPC module after graphite coating

Making of gas gap

Gluing of spacers and nozzles
Results

![Graph 1](image1.png)

Leakage current as a function of the applied voltage

- 100% Tetrafluoroethane (C₂H₂F₄) 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/cm² for -15 mV threshold and ~ 180 Hz/cm² for -20 mV threshold.

(a) The efficiency as a function of the voltage

(b) Noise rate as a function of the voltage

![Graph 2](image2.png)
Summary

• The module is fabricated using bakelite having bulk resistivity $4 \times 10^{10} \, \Omega \, \text{cm}$
• An efficiency $\sim 95\%$ from 9.4 kV onwards at -15 mV threshold and $\sim 85\%$ from 10.1 kV onward at -20 mV threshold obtained
• Maximum noise rate found to be $\sim 500 \, \text{Hz/cm}^2$ for -15 mV threshold and $\sim 180 \, \text{Hz/cm}^2$ 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
References

- M. Abbrescia et al., Nucl. Instr. and Meth. A 394 (1997) 13
- A. Sen et al., JINST 15 (2020) C06055
- A. Sen et al., Nucl. Instr. and Meth. A 1024 (2022) 166095
- F. Bossu et al., JINST 7 (2012) T12002

Acknowledgment

- Ms. Rudrapriya Das
- Mr. Shivshant Chauhan
- Mr. Subrata Das

Thank You