Short RPC review

1. BELLE RPCs:
   - STREAMER MODE + PLASMA + FREON $\rightarrow$ HF
     $\rightarrow$ GLASS CORROSION
   - FIX: REDUCE $H_2O$ 2000 ppm $\rightarrow$ <10 ppm

2. BaBar RPCs:
   - STREAMER MODE
   - BUTTON DESIGN TRAPS OIL:
   - $L_3$:
   - $35^\circ C$ $\rightarrow$ RELEASE OF OIL

   $\Rightarrow$ OVERVOLTAGE

   $\Rightarrow$ INCREASED RATE OF CHEMISTRY
• Linseed oil has low resistivity if fresh (loaded with water) → creates large currents → "shorts" the gap

• If one runs voltage on fresh linseed oil, on creates stalagnites

→ emission points

• All other materials seems to be insensitive to temperature

• Is there something more?

- Electrolytic effects:
  Water modulates resistivity of linseed oil.
- Electrolytic process in Linseed oil

**Linseed oil:** "It is a mixture of the glycerides of linolenic, linoleic, oleic, stearic, and palmitic acids with high degree of unsaturation of its fatty acid radicals." It is pressed from seeds.

**Potential trouble with the Linseed oil:**
1) A current in “Fatty acids” is modulated by a presence of water. (Organic Fatty acids have a form: R-COOH)
2) Unsaturated bonds may cause a lower resistivity.

1) **If there is no water** then R-COO\(^-\) just shares a charge:
   => **The current slowly decays** as R-COOH is consumed.

2) **If there is water** then R-COO\(^-\) will share a charge and convert back to the fatty acid R-COOH.
   => **The current will continue.**

**Note:**
- **Bakelite:** "It is the phenol-formaldehyde polymer."
- **Current is also carried via ions:** Phenol impurities => \( \text{H}^+ + \text{Ion}^- \)
Indeed that is what is observed:

Experimental evidence that the current through the Linseed oil decays if we do not add water:

- Adding water sharply increases the current (similar result obtained by Ch. Lu, Princeton).
- Reversal of the voltage does not return the current to the original high value !!
- There is an evidence of an accumulation of some substance on the surface of the Linseed oil (probably related to R-COO).
Model of BaBar RPC problems:

a) **Too much water**, in some chamber, which is distributed non-uniformly throughout the edges and supports.
b) **Not enough water**, in some chambers, which will stop the charge transfer through the Linseed oil film layer, and this will cause a charging up effects. The Linseed oil will become some sort of shutter, which prevents a flow of charge.
c) ** Unsaturated bonds**, i.e. non-polymerized Linseed oil, which makes it less resistive. This effect is non-uniform throughout the chamber due to a non-uniform distribution of the Linseed oil. Adding oxygen will help to polymeryze the Linseed oil which would increase its resistivity.

Note: None of this is proven in the real BaBar chambers yet !!
G. AIELLI - IMPORTANCE TO TEST INDIVIDUAL COMPONENTS

G. PUGLIESE - IMPORTANCE TO TEST USING J & M RADIATION SOURCES.

(FABIO) - A NEW OIL?

- IT IS IMPORTANT TO DO THE TESTS WITH VERY LARGE SYSTEM
- BAKELITE RESISTIVITY SUDDEN INCREASE.