

## Short RPC review

### 1. BELLE RPCs

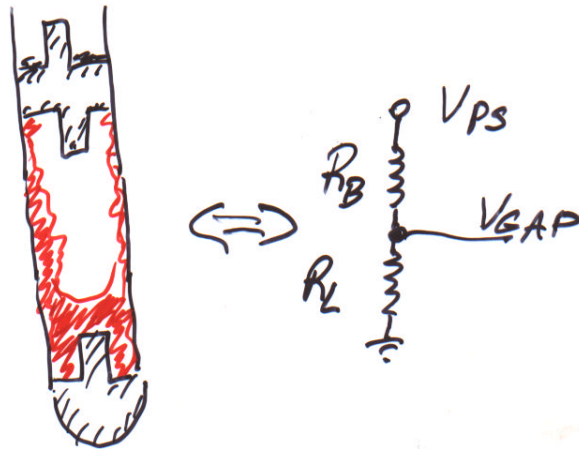
- STREAMER MODE + PLASMA + FREON  $\rightarrow$  HF  
 $\rightarrow$  GLASS CORROSION
- FIX: REDUCE  $H_2O$  2000ppm  $\rightarrow$  <10ppm

### 2. BaBar RPCs

- STREAMER MODE
- BUTTON DESIGN TRAPS OIL:



- 35°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 :

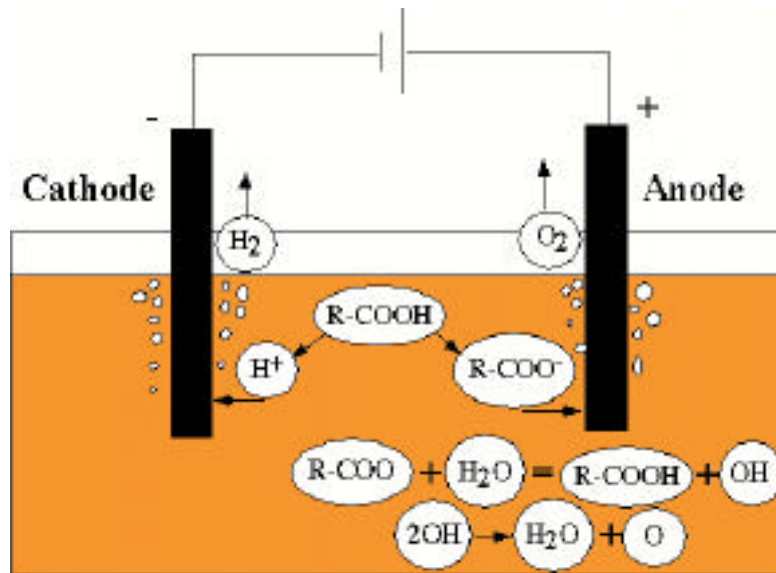
WATER MODULATES RESISTIVITY OF LINSEED OIL.

## - 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.

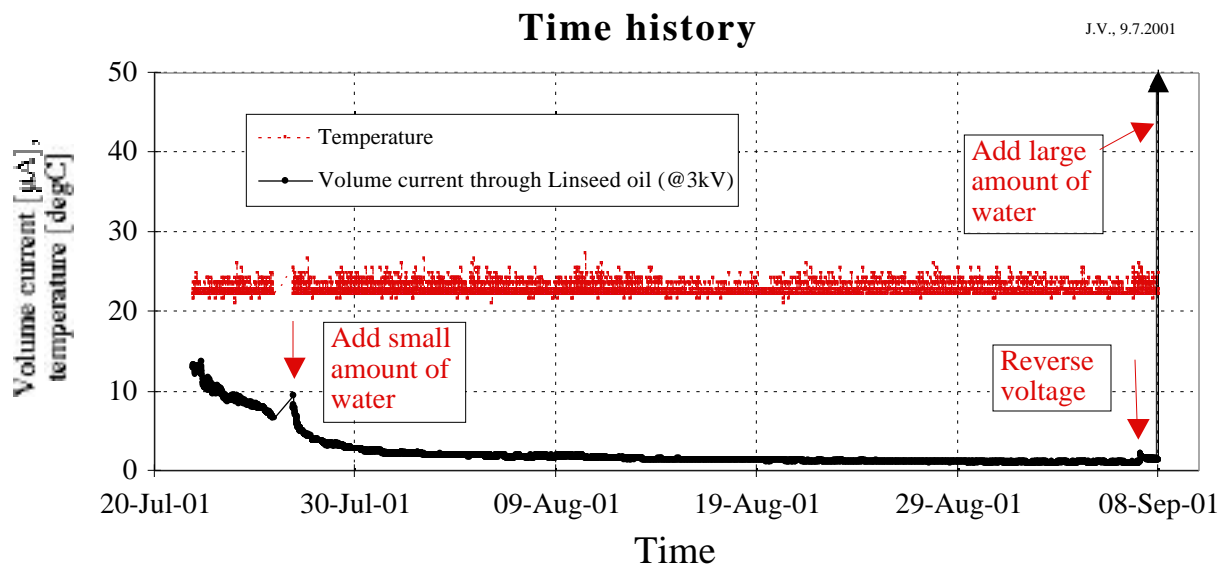
Note:

Bakelite: "It is the phenol-formaldehyde polymer."

Current is also carried via ions: Phenol impurities =>  $H^+$  +  $Ion^-$

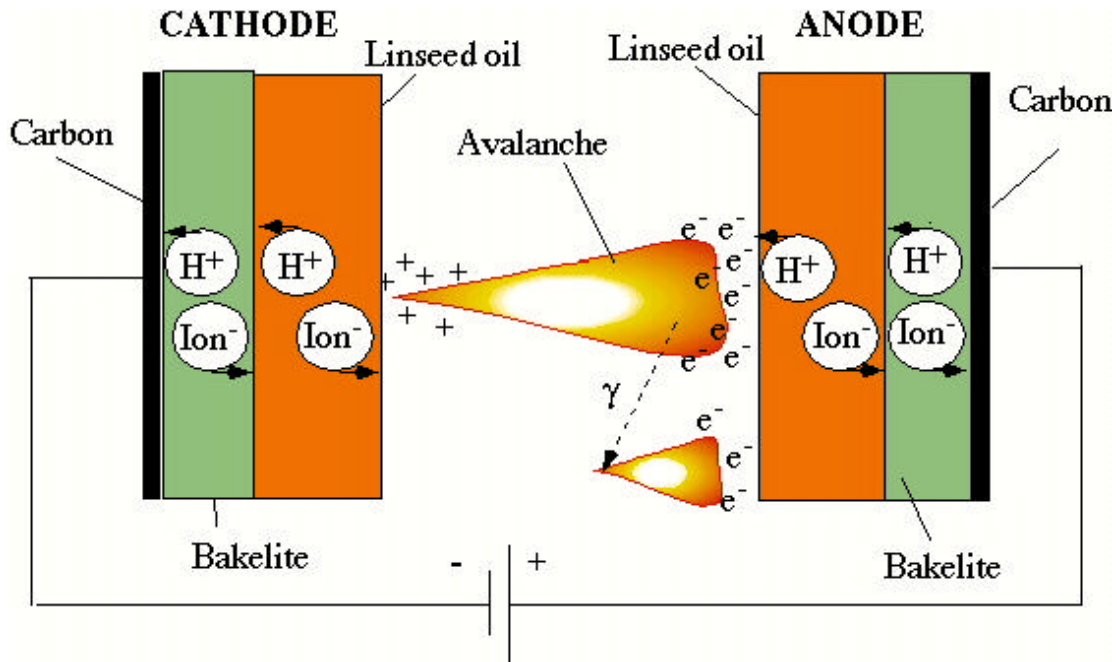
## - Indeed that is what is observed:

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).

## - BaBar RPC:



### Model of BaBar RPC problems:

- Too much water, in some chamber, which is distributed non-uniformly throughout the edges and supports.
- 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.
- 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 polymerize 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  
& G. PASSALEVA USING  $\gamma$  & M RADIATION  
SOURCES,

(FABIO) - A NEW OIL ?

- IT IS IMPORTANT TO  
DO THE TESTS WITH  
VERY LARGE SYSTEM

- BAKELITE RESISTIVITY SUDDEN  
INCREASE.