Dielectric Strength Notes
Note 9

1966

Breakdown Strength of Ethylene Glycol

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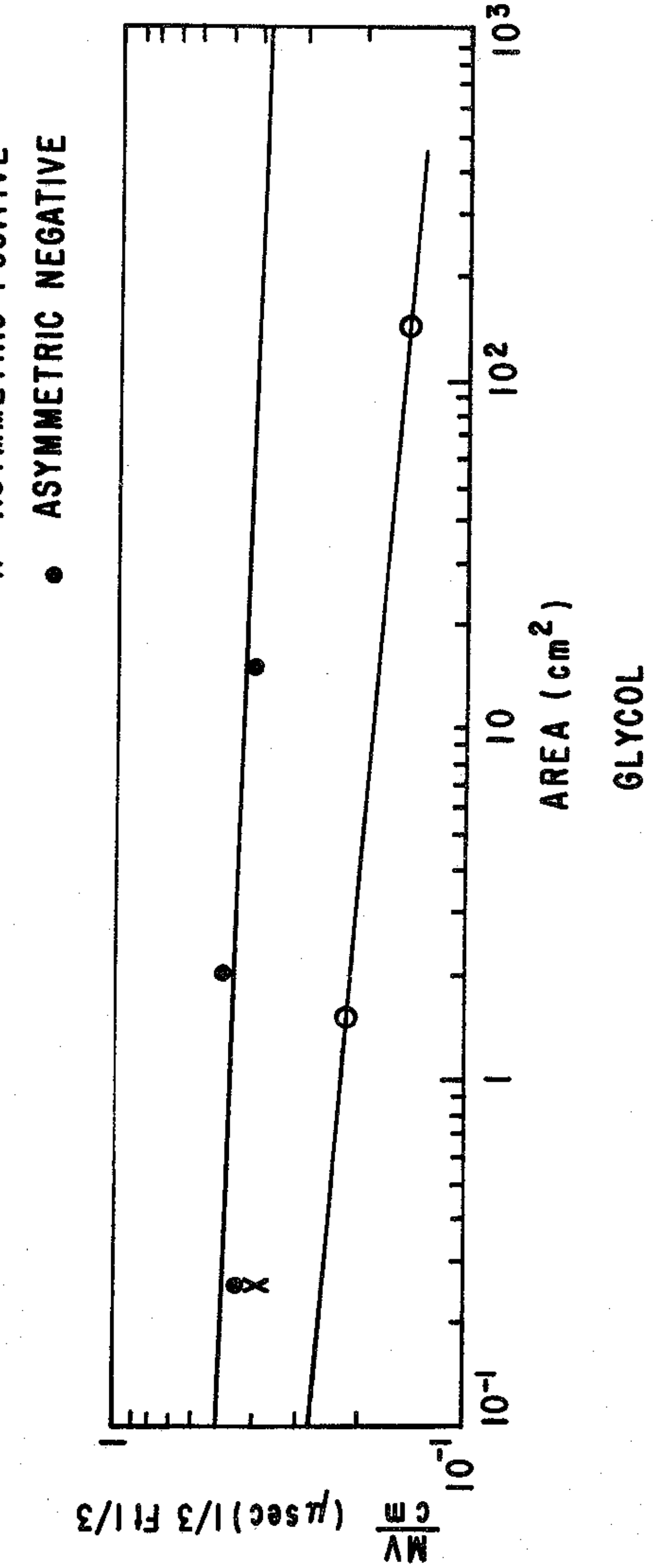
Area cm^2 (A)	t(μsec)	Gap cm(d)	$Ft^{1/3}$		Method	Ref.		$Ft^{1/2}$
0.1	.06	0.2	.39		Ball Bearings	B.93	UNIFORM FIELD	25
1.0	.09	.65	.18					
1.5	.14	.96	.21	.22	Crossed Cylinders	B.210		16
2.0	.28	1.25	.26					
140	.13	.63	.13					
140	.30	.94	.17	.15	Plates	B.211		115
140	.22	1.25	.15					
				Corrected				
.25		1.1	.51	43	+ve ball			Asymmetric field
.25		1.1	.53	45	-ve ball			
2		2.0	.59	49	-ve rod			
15		4	.46	41	-ve rod			

The above data is too sparse to draw any definite conclusions; the ball bearing experiment seems to have given an answer unexpectedly higher than the other two, and this may be an indication (as in the Russian Data on water) of an increase in strength for small gaps.

There is insufficient variation of t in individual experiments to permit a better guess at the time dependence, than $t^{1/3}$. In fact, in the experiments with plates and crossed cylinders, where the time is changed markedly when the separation is changed, (partly owing to change of capacity) the simplest interpretation is that of a constant field independent of gap and time. This cannot be, however, since individual settings show a time dependence and show breakdowns after peak voltage. The mose useful assumption seems to be $Ft^{1/3}$ = a constant, with the line drawn to pass through the two points of largest area, and having then the standard slope.

The positive asymmetric point is corrected using $1 + .12 (F.e. -1)^{1/2}$ but still lies high. The asymmetric negative points are similarly corrected; they show little area effect. No direct measurement of a large polarity effect has been made.


O SLOW UNIFORM
X ASYMMETRIC POSITIVE
● ASYMMETRIC NEGATIVE
10^{-1}
1
10
10^2
10^3
AREA (cm^2)
GLYCOL
1
10^{-1}
$\frac{MV}{cm}$ (μsec)1/3 Ft1/3