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v Q

مختصری از تئوری آزمایش:

$$C = \frac{Q}{v}$$

d A

$$C = k\epsilon_0 \frac{A}{d}$$

SI ϵ_0

k

$$\epsilon_0 = 8.85 \times 10^{-12} \frac{A \cdot sec}{V \cdot m}$$

$800cm^2$ $400cm^2$

$1mm$

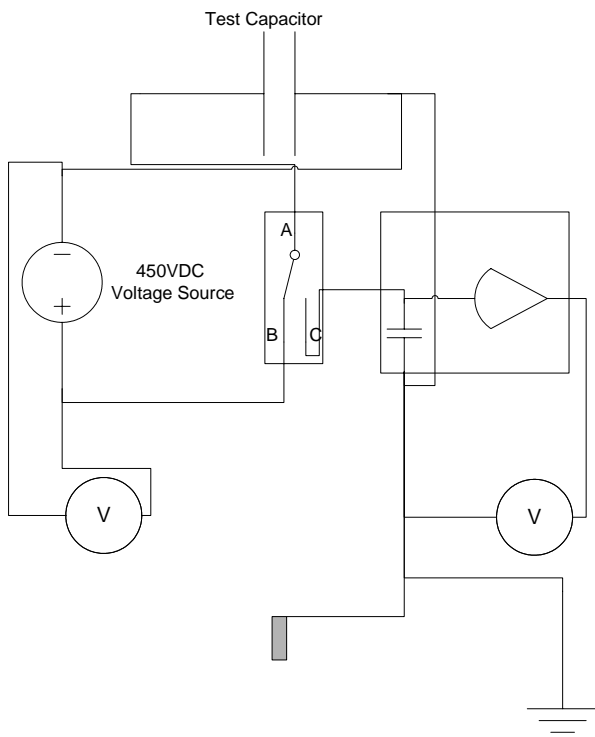
(Q) v

V_A

(C_A)

$$Q = C_A \cdot V_A$$

شرح آزمایش:



(/)

AC AB

$4mm$

(AC

AB

AC

($800cm^2$ $400cm^2$)

$v(\text{volts})$	$Q(\text{nA}\cdot\text{sec})$	
	خازن كوچك	خازن بزرگ
50	8	20
100	16	42
150	28	72
200	38	84
250	52	112
300	64	136

$$C_{\text{بزرگ}} = \frac{[vQ]}{[v^2]} = \frac{101600}{227500} = 0.447\text{nF} = 447\text{pF}$$

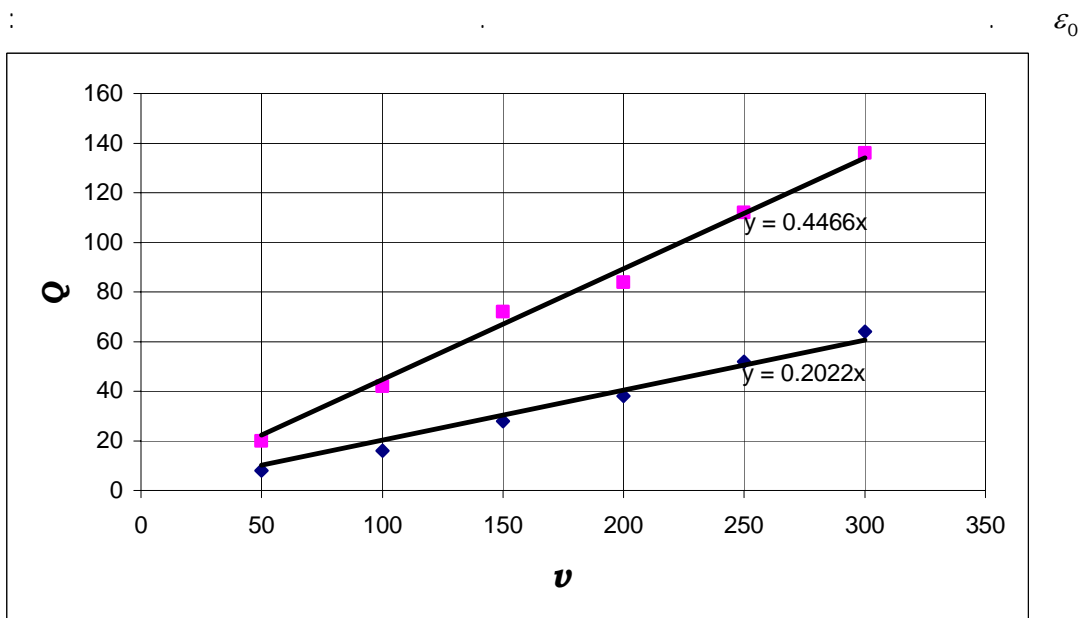
$$C_{\text{كوچك}} = \frac{[vQ]}{[v^2]} = \frac{46000}{227500} = 0.202\text{nF} = 202\text{pF}$$

$$d = 4\text{mm} = 4 \times 10^{-3}\text{m}$$

$$C = \epsilon_0 \frac{A}{d}$$

$$C_{\text{كوچك}} = 8.85 \times 10^{-12} \times \frac{400 \times 10^{-4}}{4 \times 10^{-3}} = 885\text{pF}$$

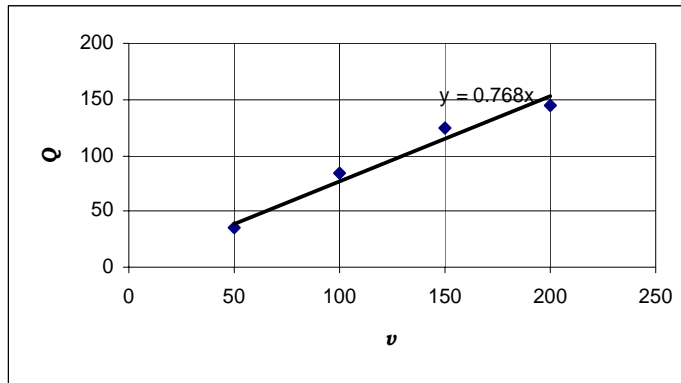
$$C_{\text{بزرگ}} = 8.85 \times 10^{-12} \times \frac{800 \times 10^{-4}}{4 \times 10^{-3}} = 1770\text{pF}$$



v (volts)	Q (nC)
50	36
100	84
150	124
200	144

$$C = \frac{[Qv]}{[v^2]} = \frac{57600}{75000} = 0.768nF = 768pF$$

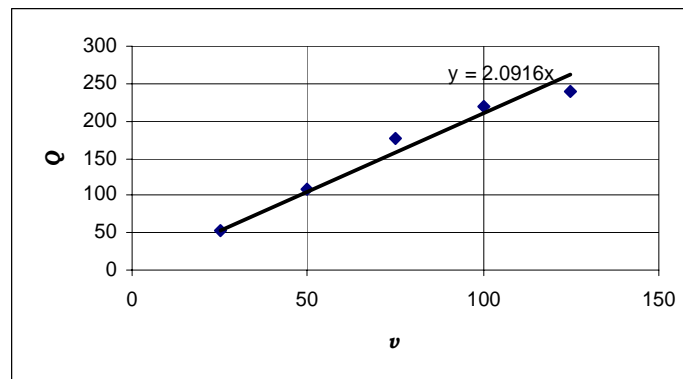
$$k = \frac{768pF}{446pF} = 1.722$$



v (volts)	Q (nC)
25	52
50	108
75	176
100	220
125	240
150	240

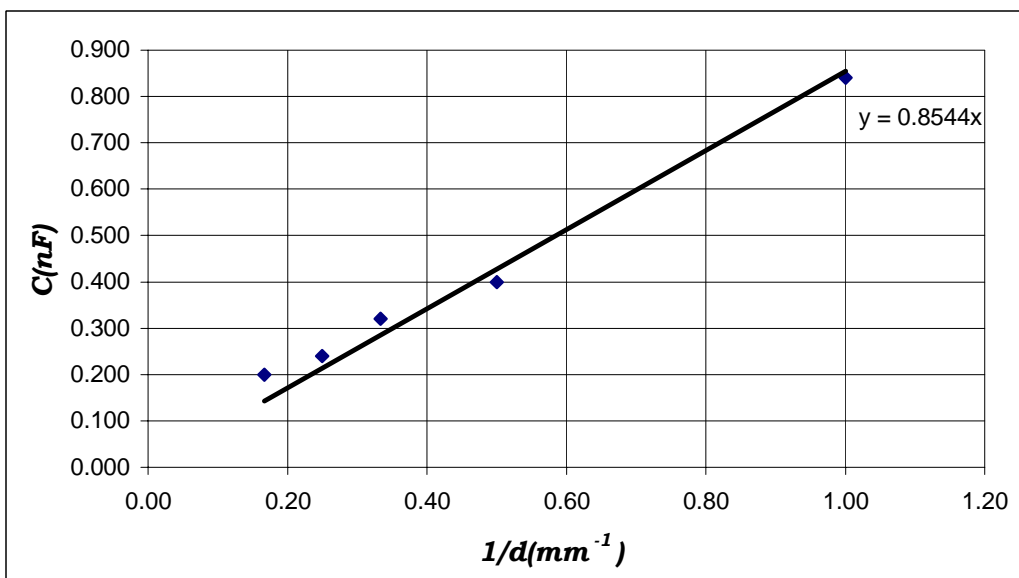
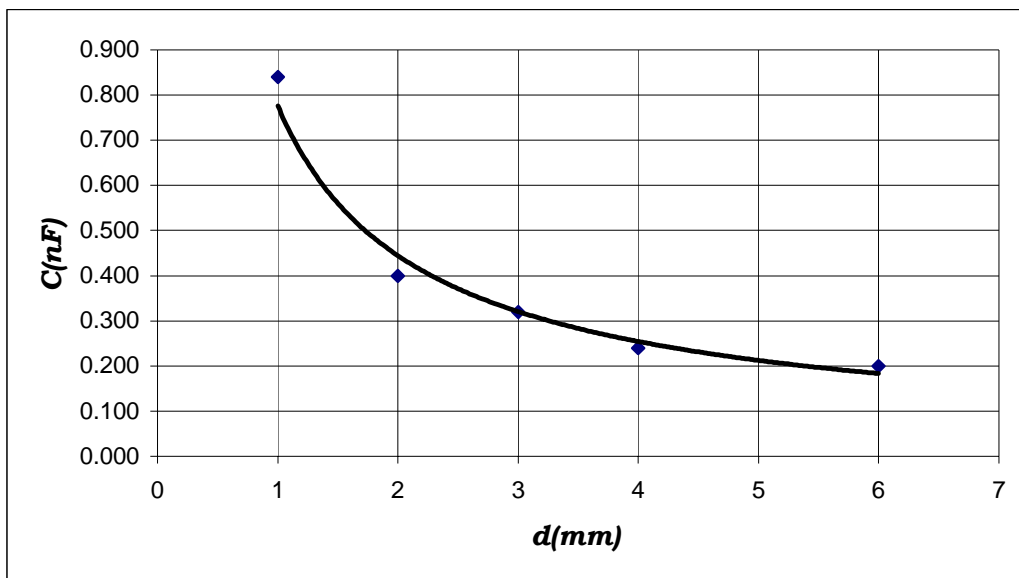
$$C = \frac{[vQ]}{[v^2]} = \frac{71900}{34375} = 2.092nF = 2092pF$$

$$k = \frac{2092}{446} = 4.691$$



100v

$d(mm)$	$1/d(mm^{-1})$	$Q(nC)$	$C(nF)$
1	1.00	84	0.840
2	0.50	40	0.400
3	0.33	32	0.320
4	0.25	24	0.240
6	0.17	20	0.200



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آزمایش تعیین ظرفیت خازن تخت و عوامل موثر بر آن

$$C_2 \quad C_1$$

$$Q = Q_1 + Q_2 = C_1 V_1 + C_2 V_2 = C_1 V + C_2 V = (C_1 + C_2) V \Rightarrow$$

$$C_{eq} = C_1 + C_2$$

$$V = V_1 + V_2 = \frac{Q_1}{C_1} + \frac{Q_2}{C_2} = \frac{Q}{C_1} + \frac{Q}{C_2} = Q \cdot \left(\frac{1}{C_1} + \frac{1}{C_2} \right) \Rightarrow$$

$$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2}$$

6mm

50v

.50v

	Q(nC)	C(pF)
خازن بزرگ	6	120
خازن كوچك	14	280
خازن معادل موازي	20	400
خازن معادل سري	4	80

$$C_{\text{موازي}} = 120 \text{ pF} + 280 \text{ pF} = 400 \text{ pF}$$

$$C_{\text{سري}} = \frac{120 \times 280}{120 + 280} = 84 \text{ pF}$$