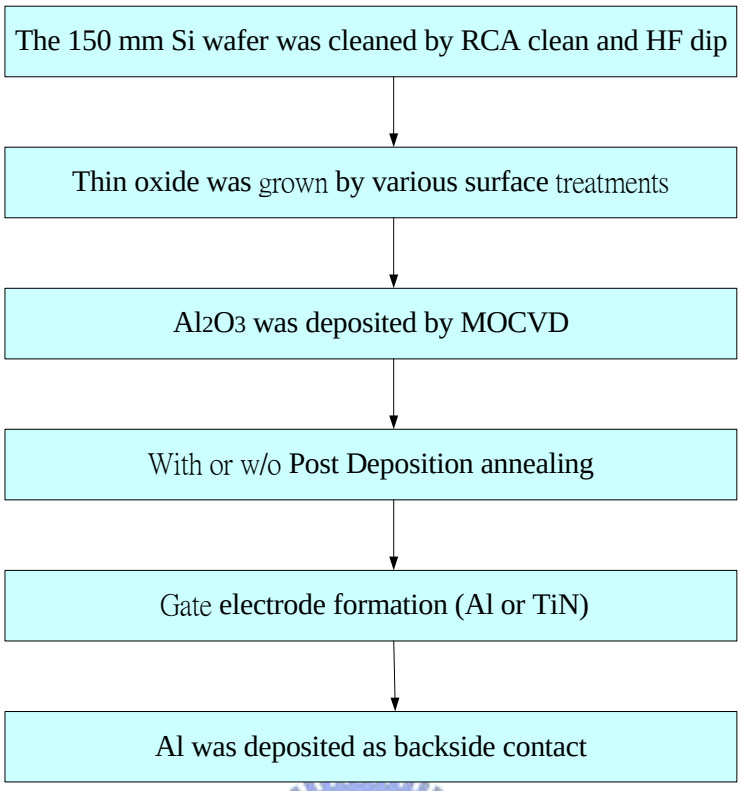


Fig. 3-1: MIS capacitor fabrication process flow

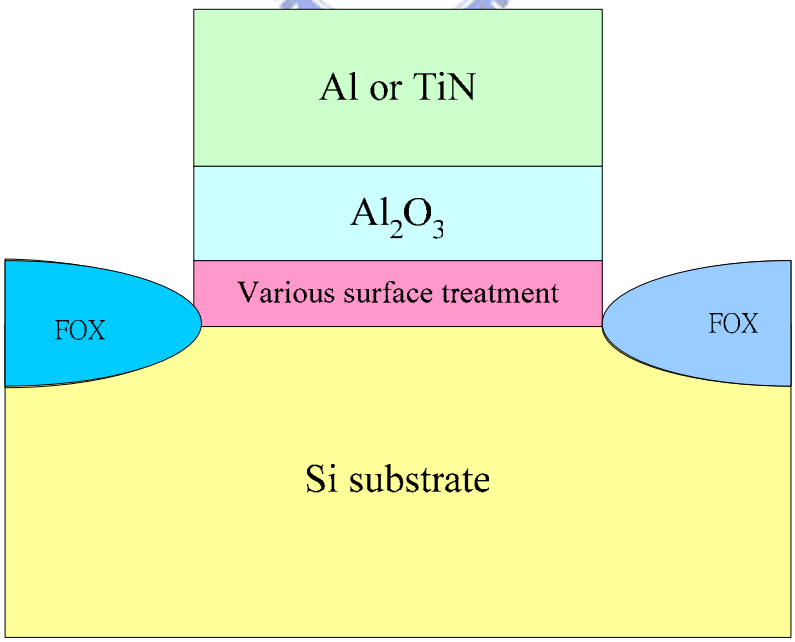
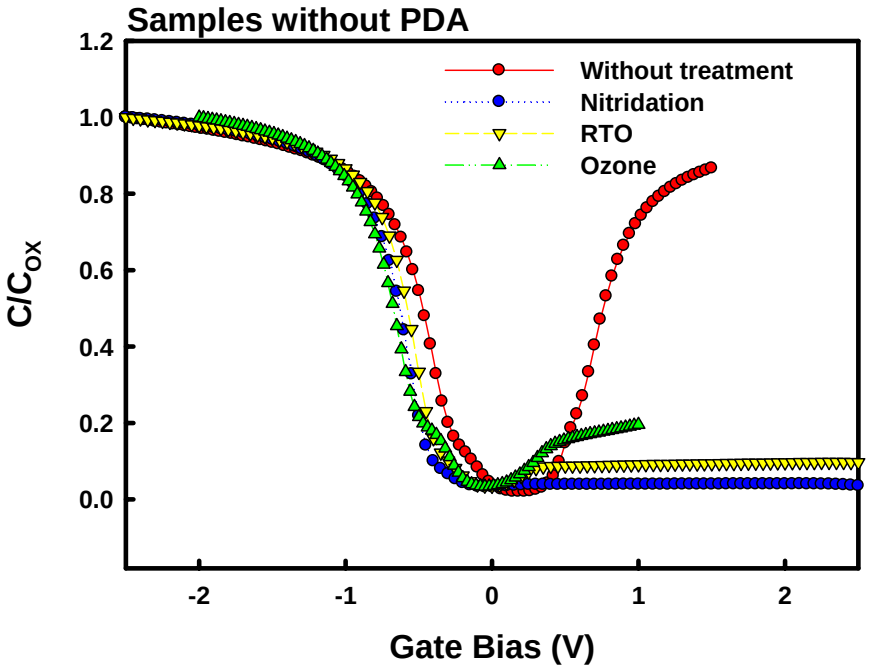


Fig. 3-2: MIS capacitor structure



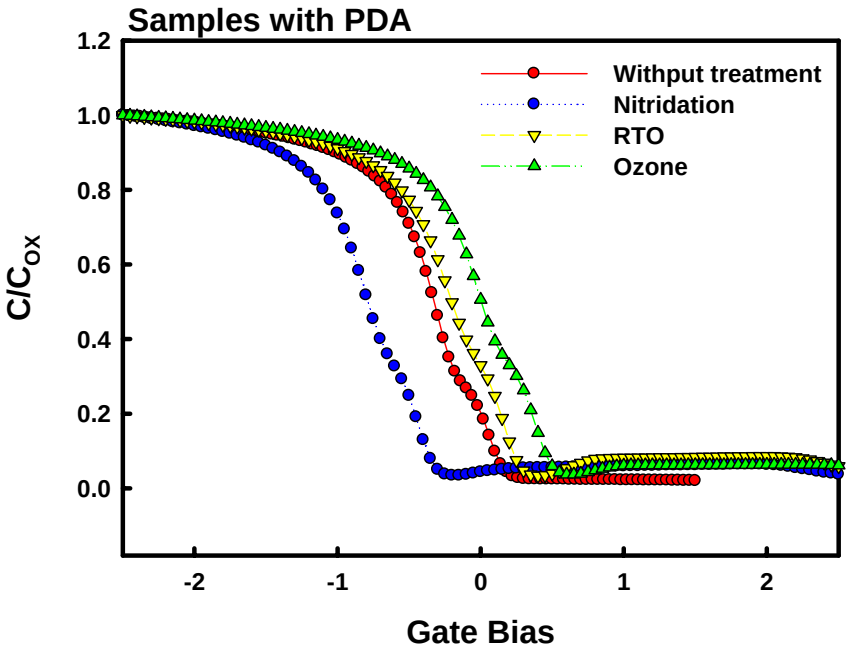
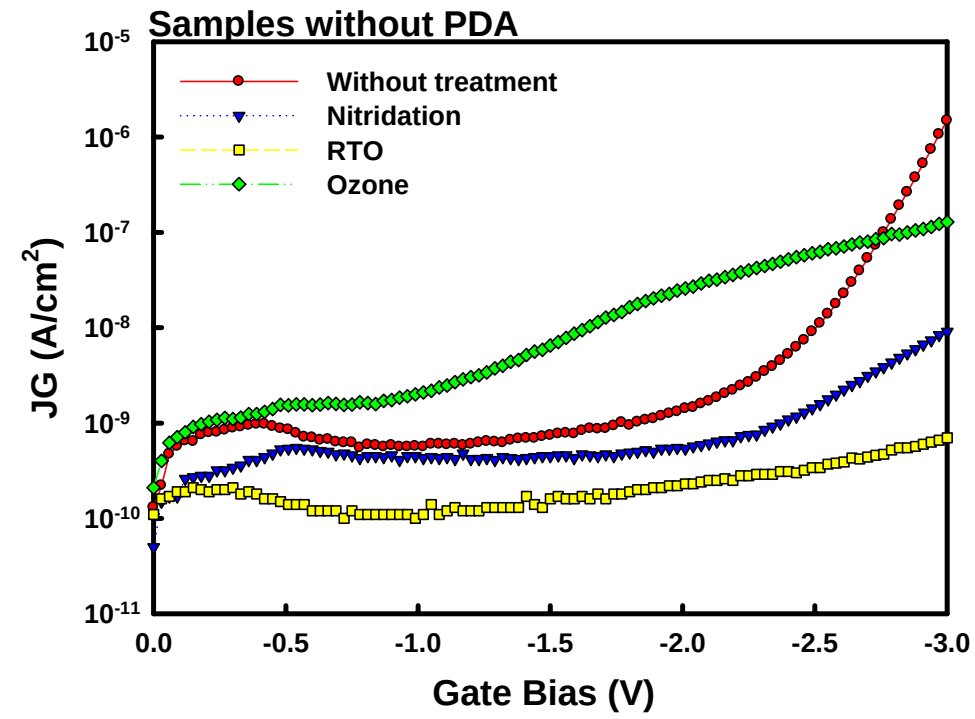


Fig. 3-3: CV curves for samples w/o and with PDA



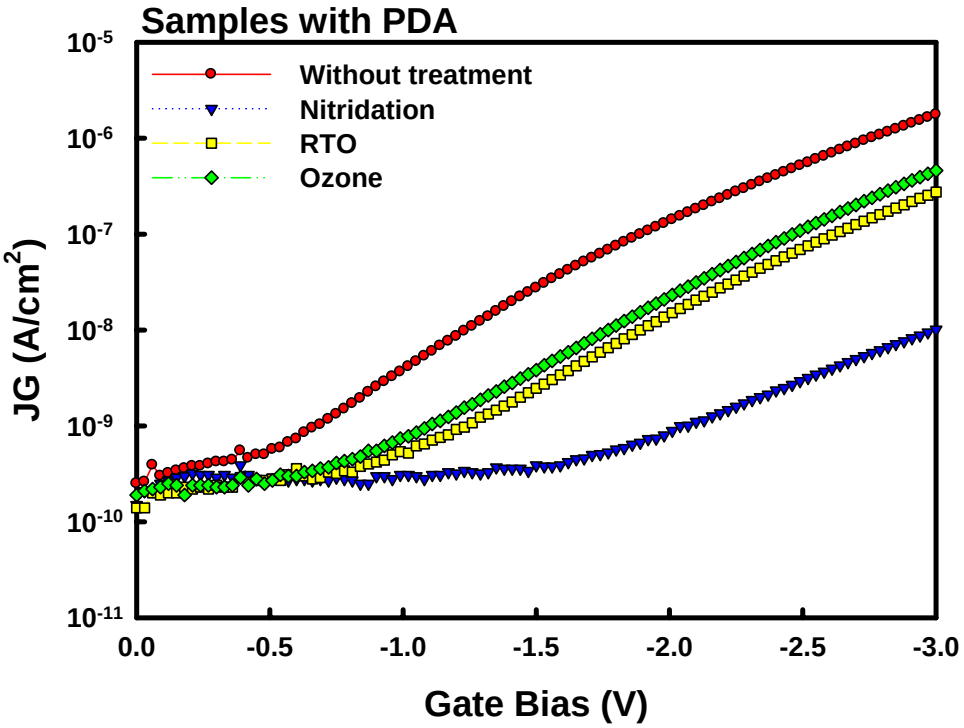


Fig. 3-4: Leakage current density versus gate bias curves for samples with and without PDA process at 900˚C

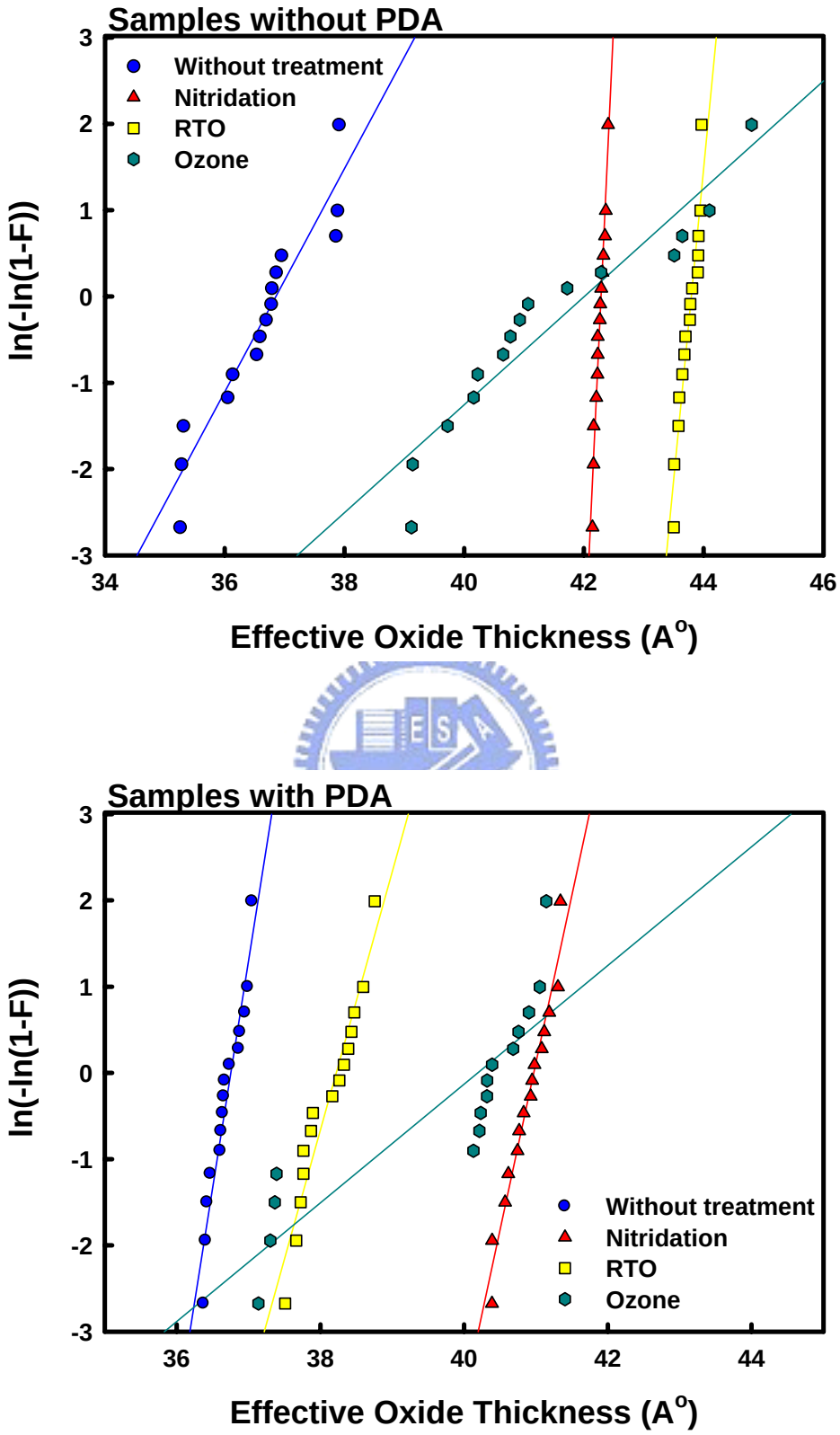


Fig. 3-5: Weibull plots for effective oxide thickness

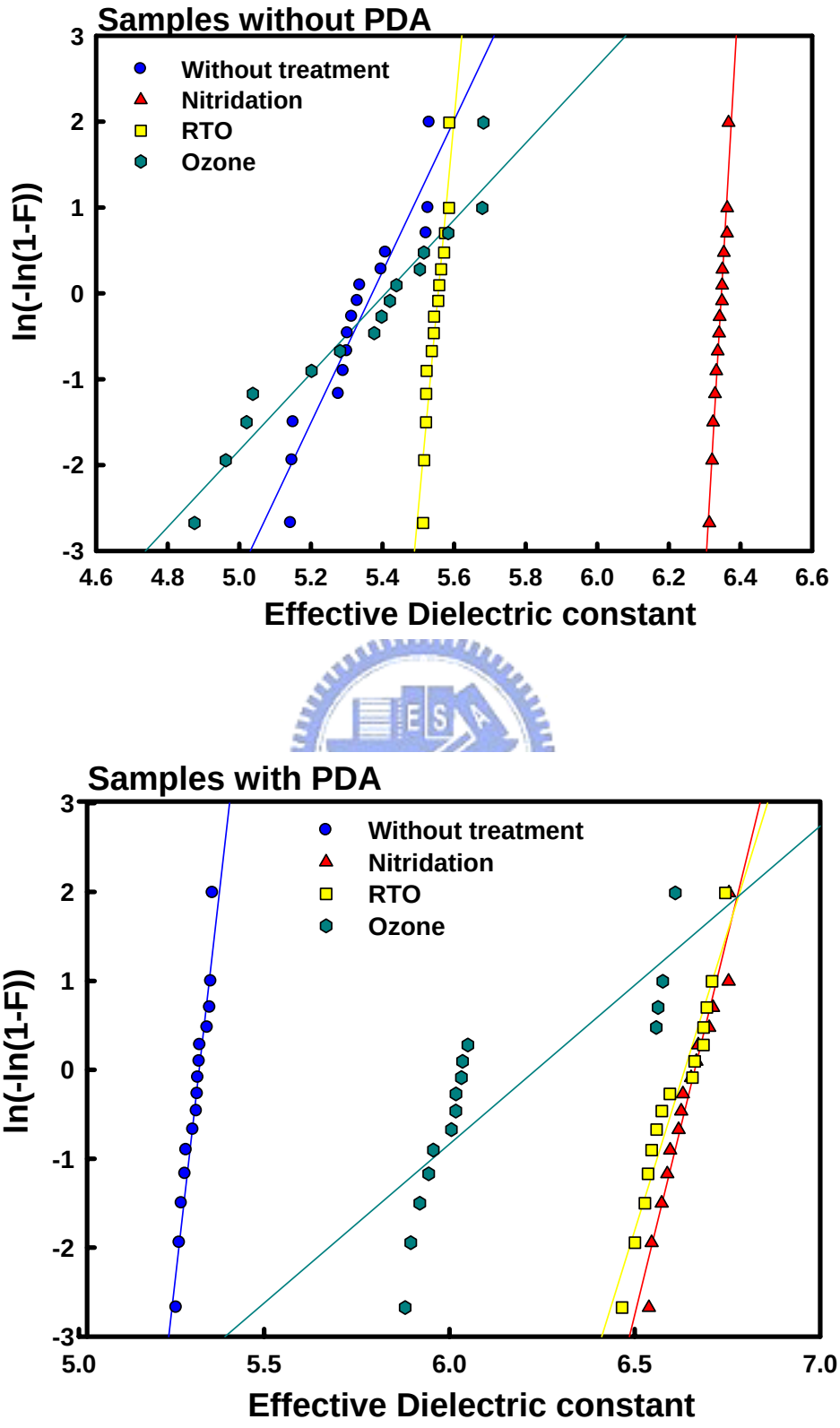


Fig 3-6: Weibull plots for effective dielectric constant

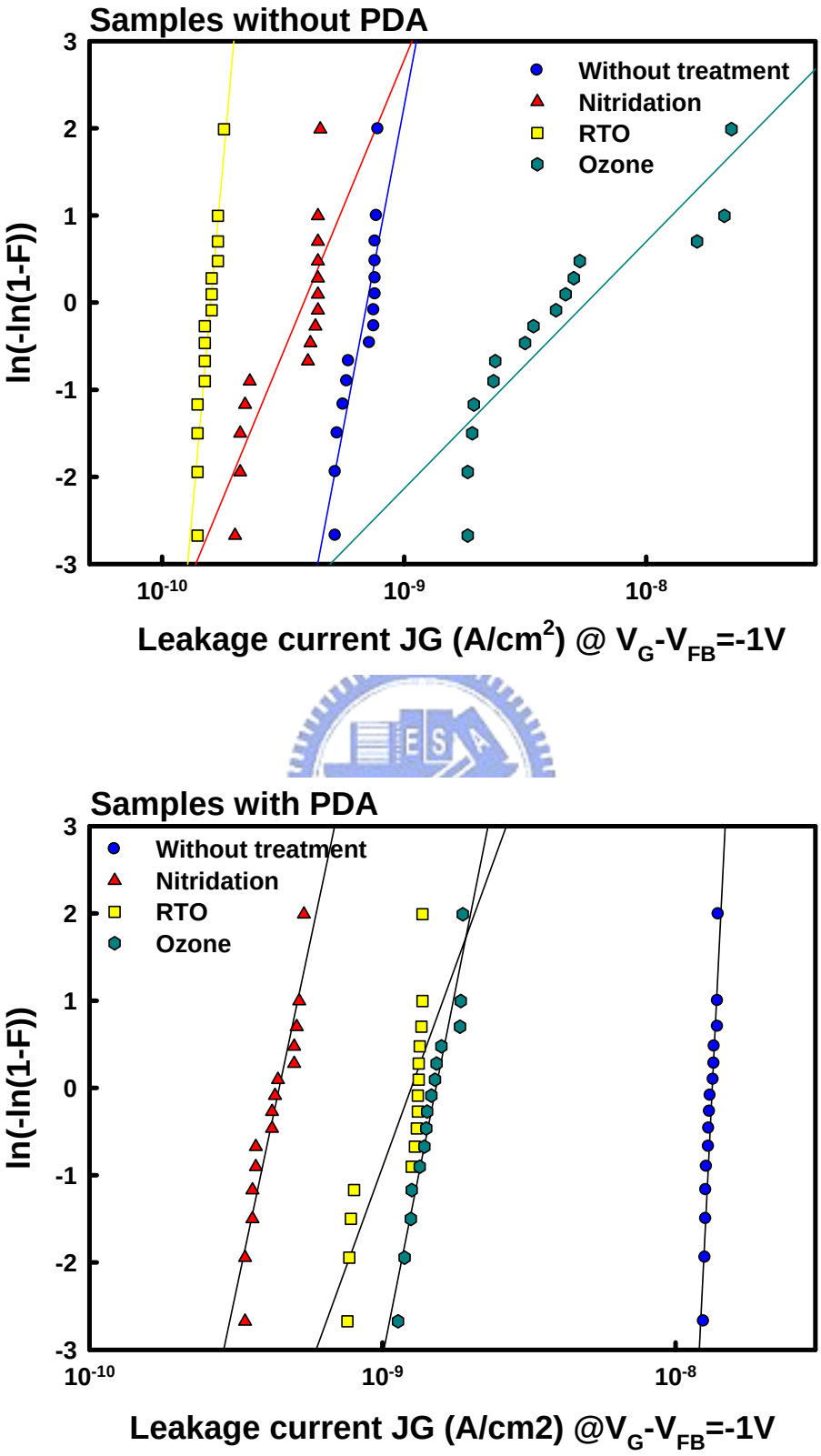


Fig. 3-7: Weibull plots for leakage current at V_G-V_{FB}=-1V

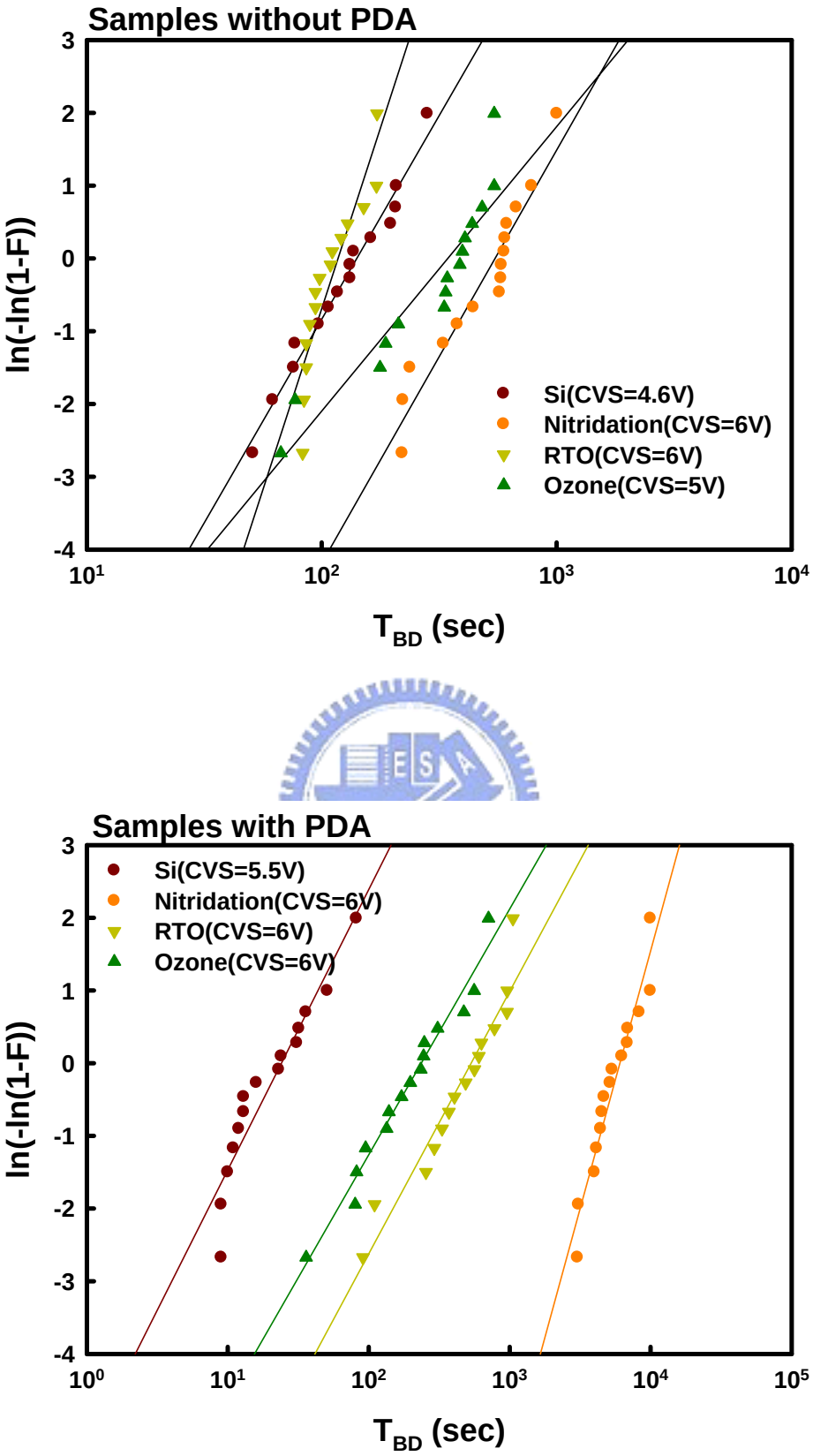


Fig. 3-8 Weibull plots for time depend dielectric breakdown

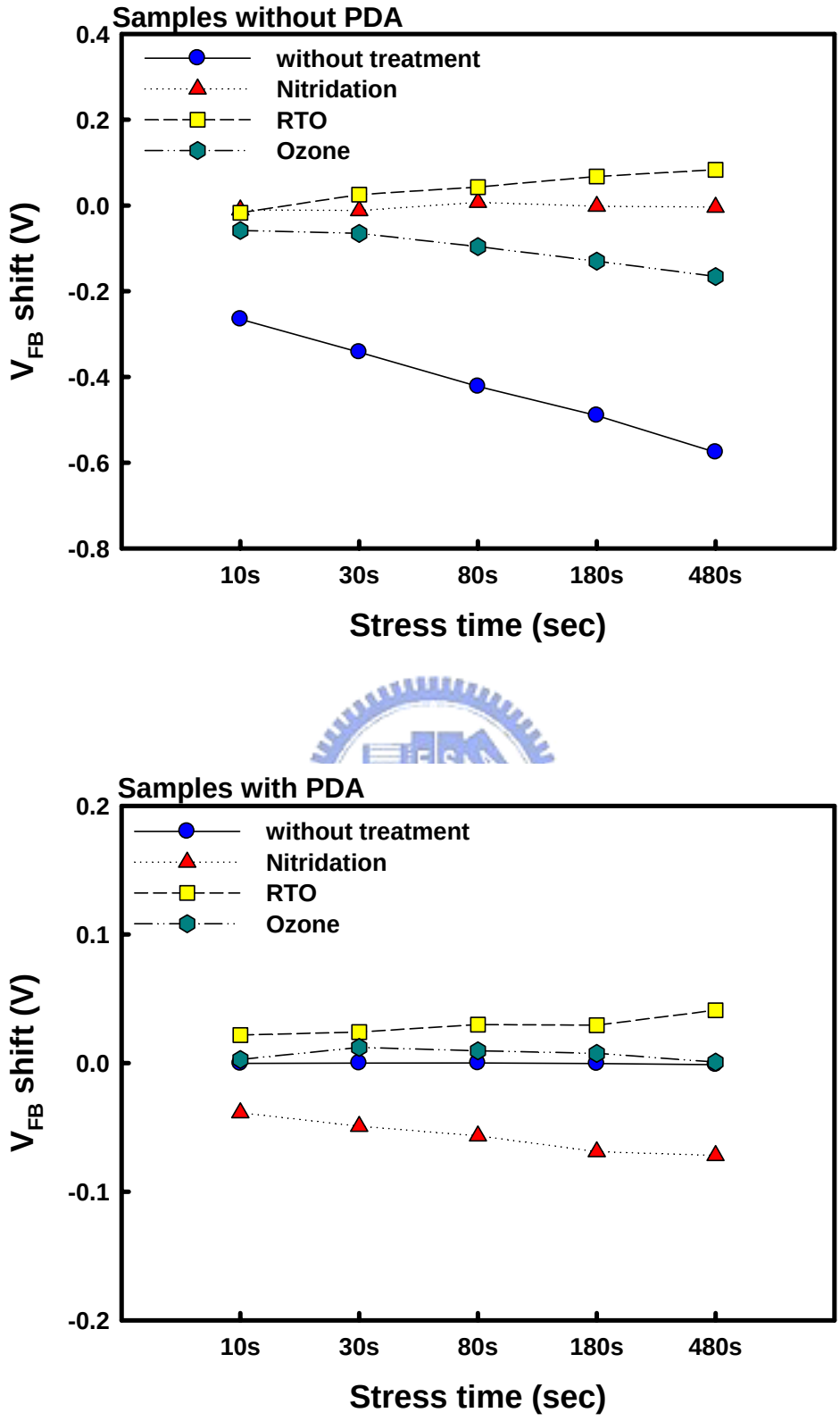


Fig. 3-9: Constant voltage stress (V_G=-3.5V) induced flatband voltage shift

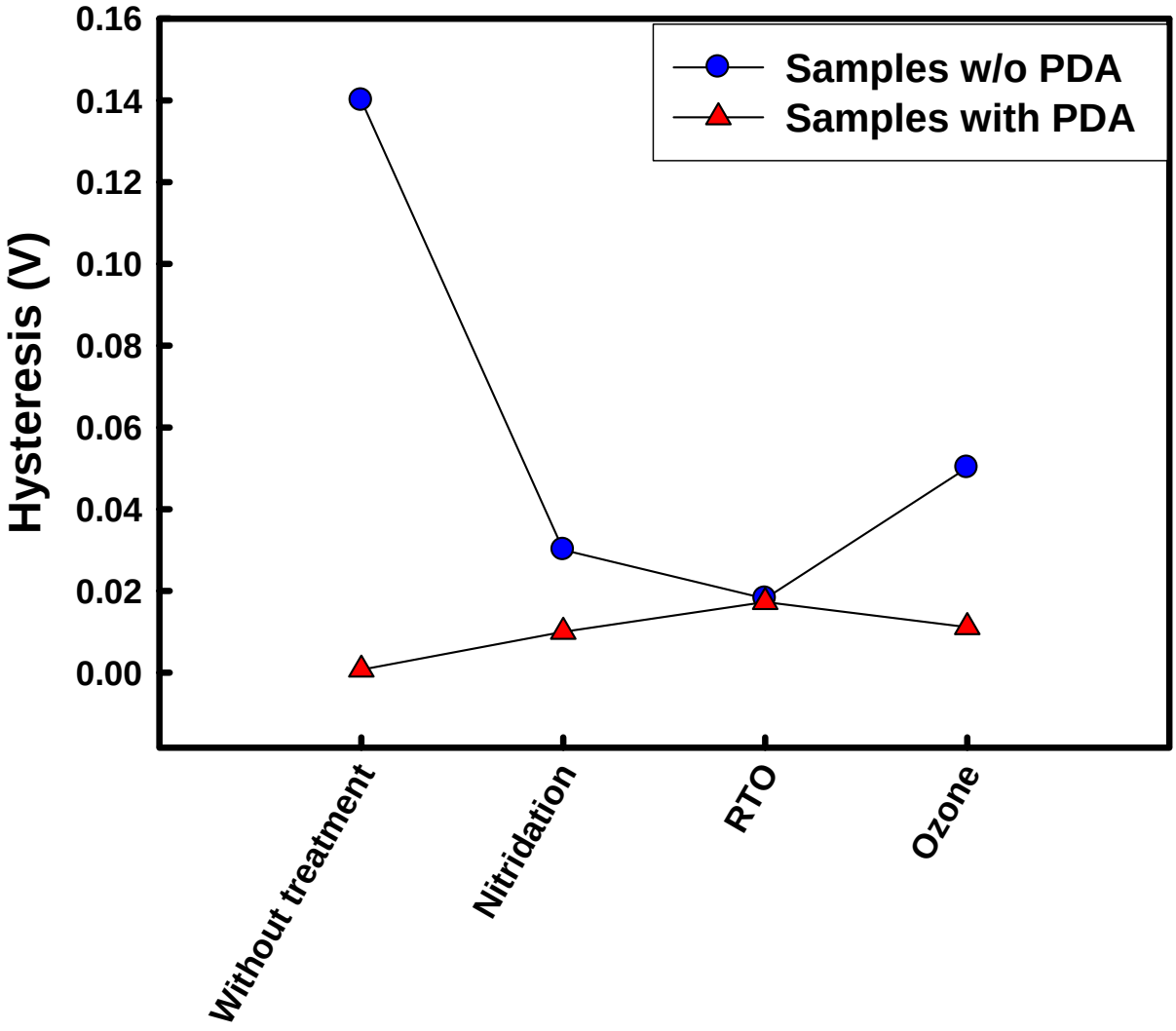


Fig. 3-10: hysteresis curve for samples with and w/o treatment

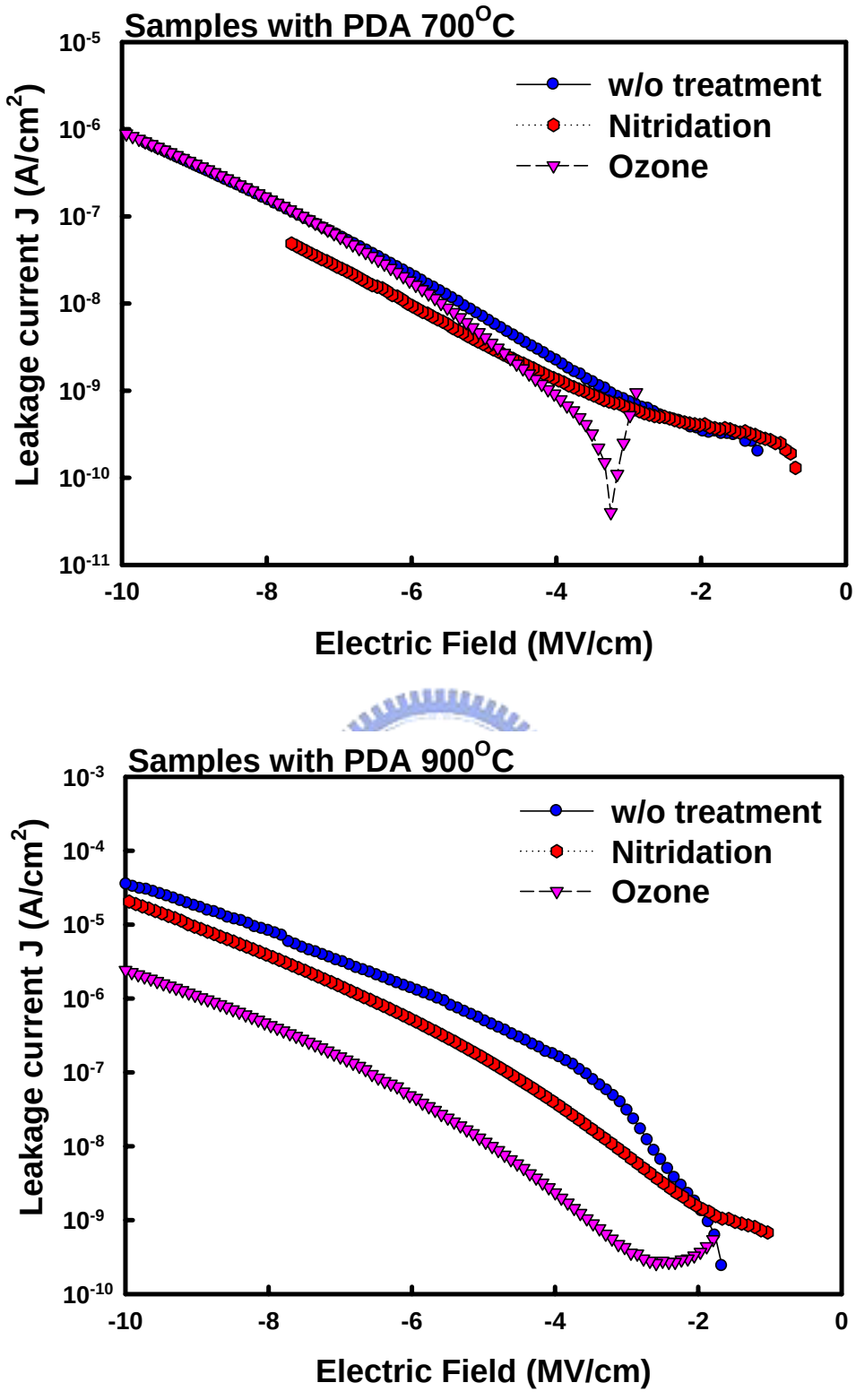


Fig. 3-11: Leakage current density versus electric field for samples with PDA 700˚C and PDA 900˚C

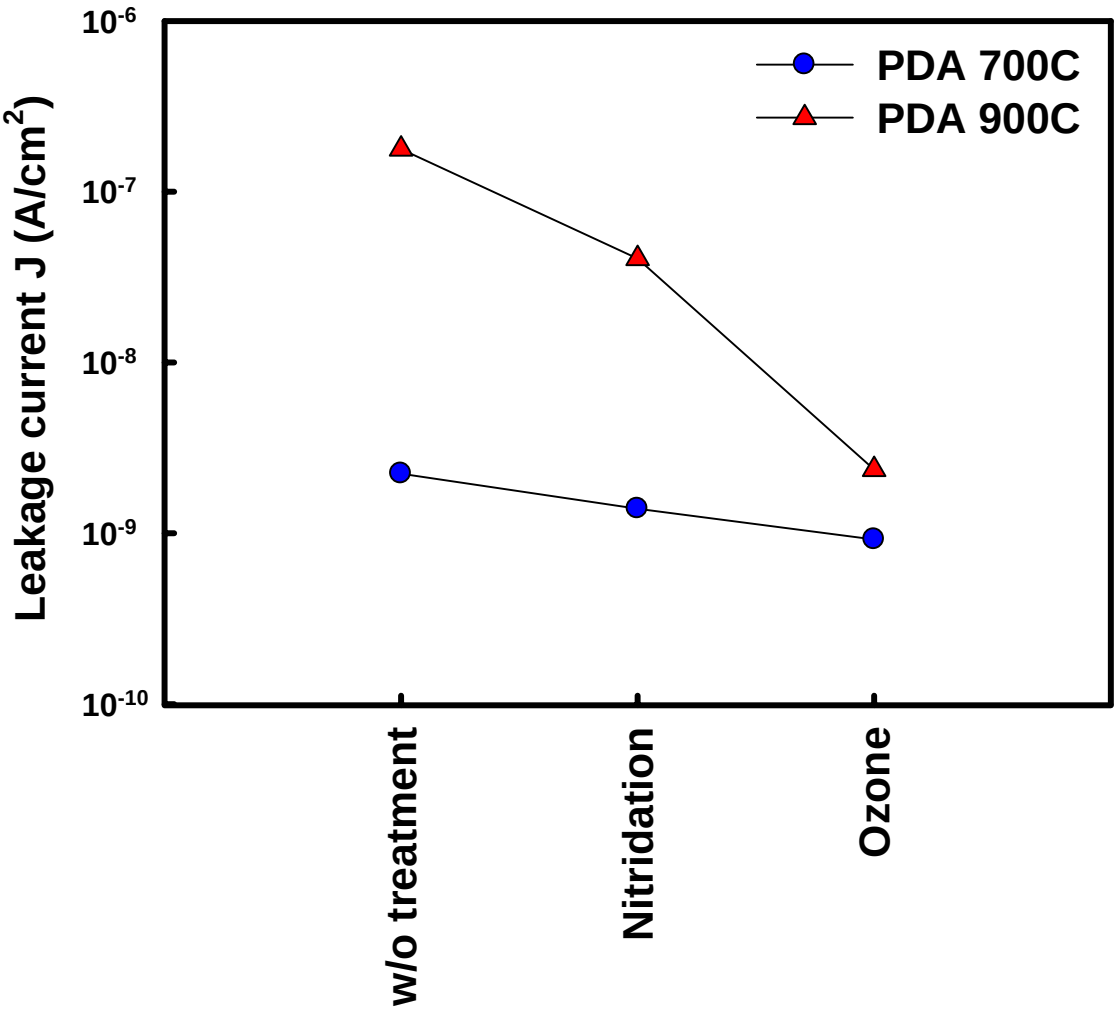


Fig. 3-12: Leakage current density comparison at 4MV/cm

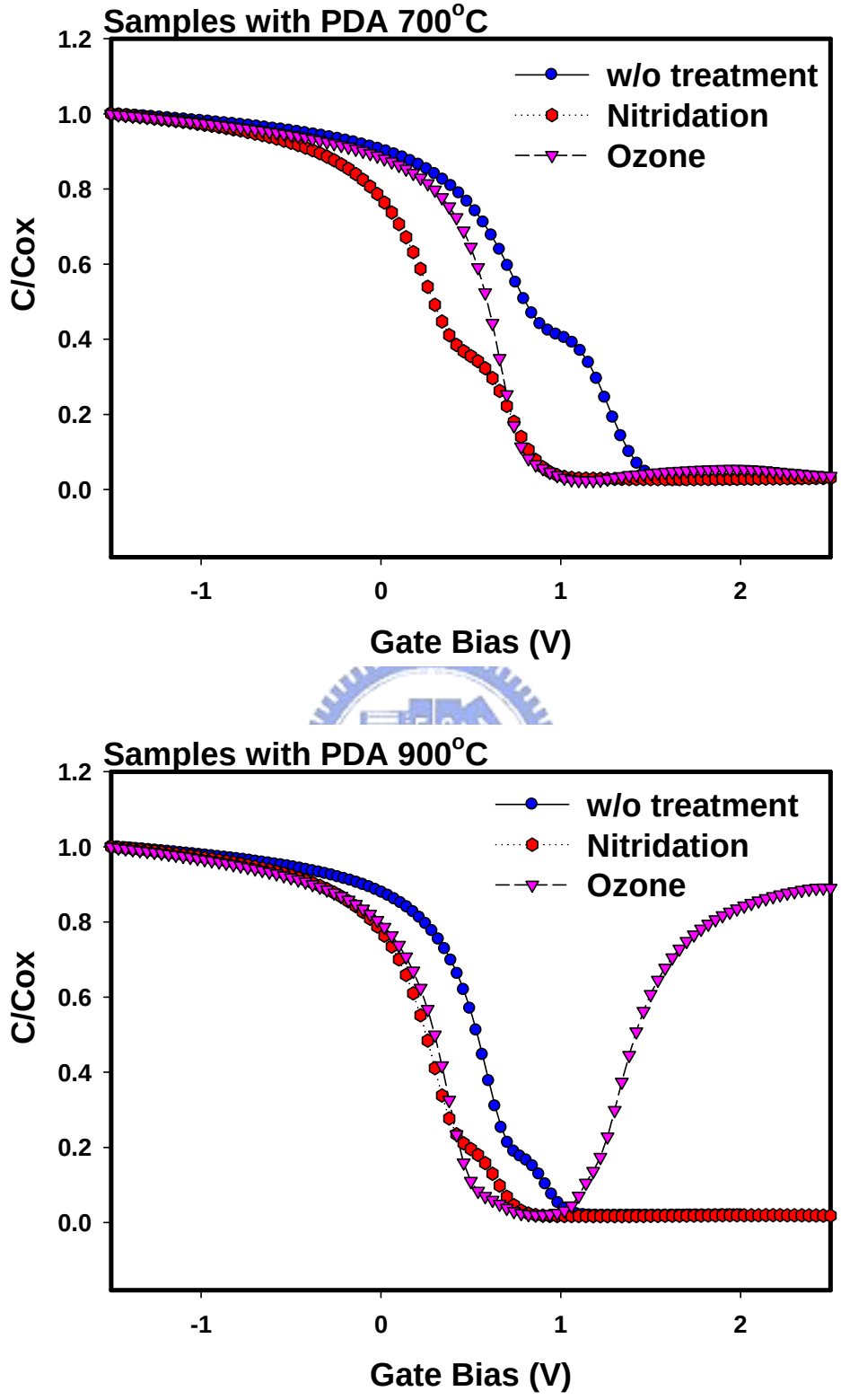
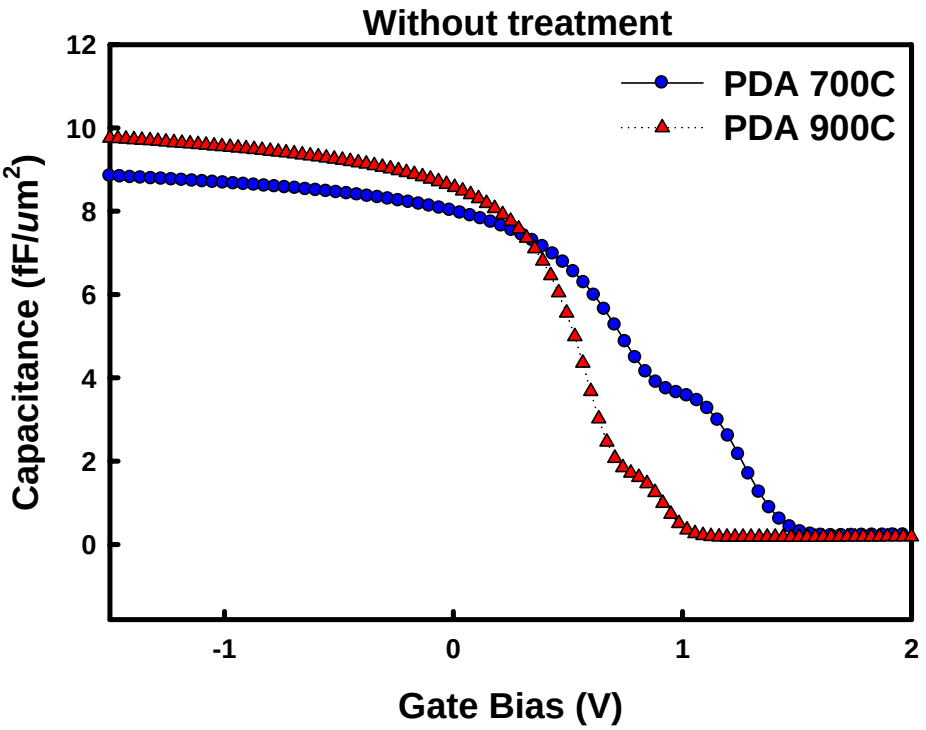
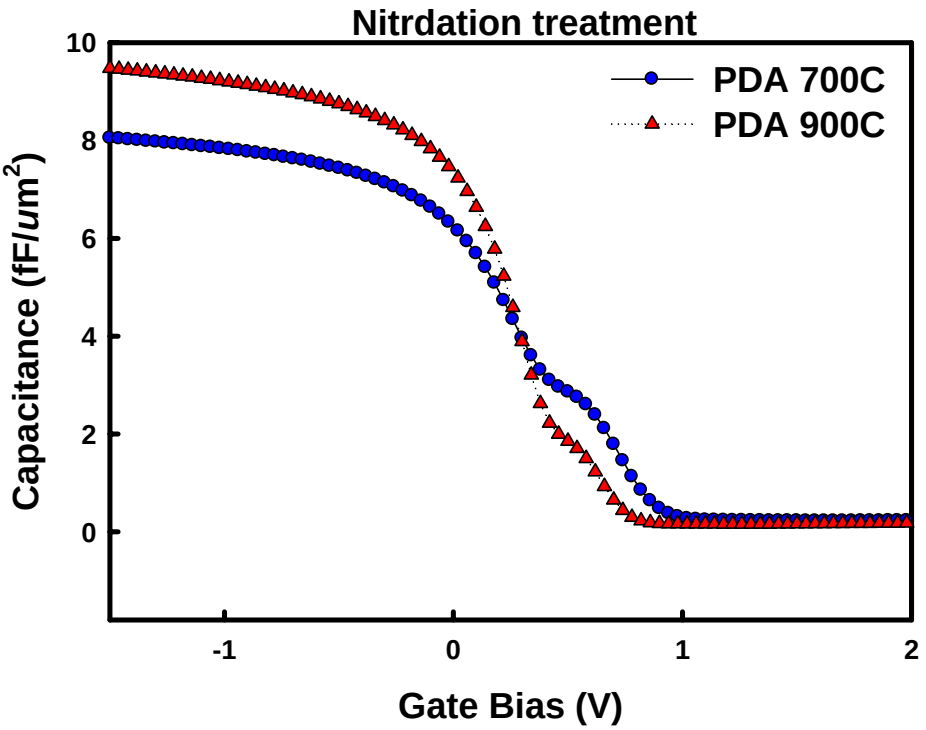


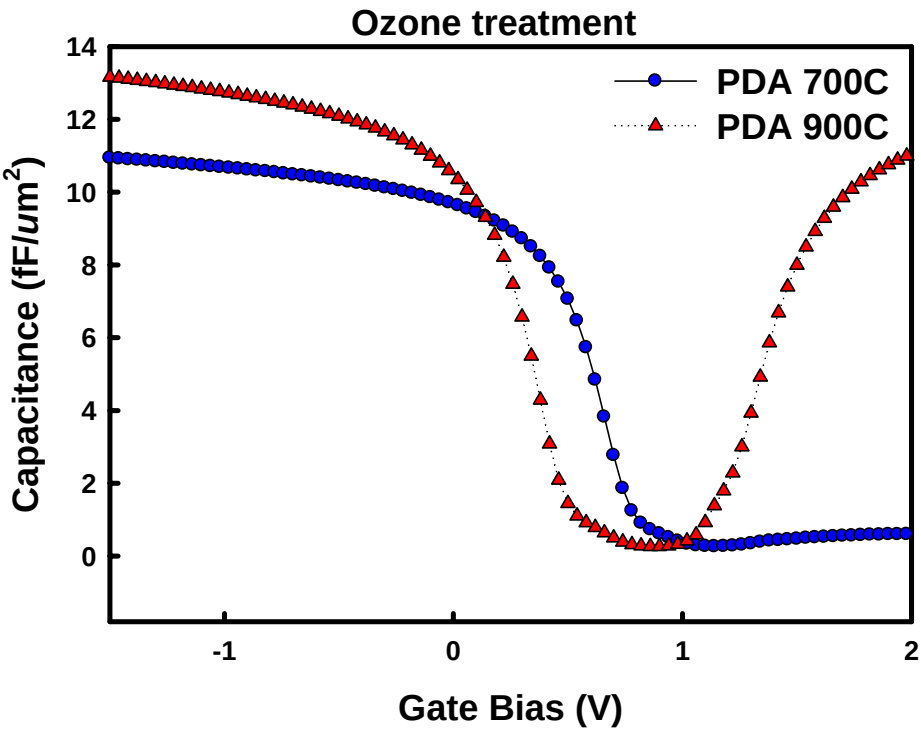
Fig. 3-13: C/Cox versus gate bias for samples with PDA 700˚C and PDA 900˚C


Without treatment
PDA 700C
PDA 900C
Capacitance (fF/um^2)
Gate Bias (V)
12
10
8
6
4
2
0
-1
0
1
2

(a)


Nitrdation treatment
PDA 700C
PDA 900C
Capacitance (fF/um^2)
Gate Bias (V)
10
8
6
4
2
0
-1
0
1
2

(b)



(c)

Fig. 3-14(a)(b)(c): The C-V curve for various surface treatments

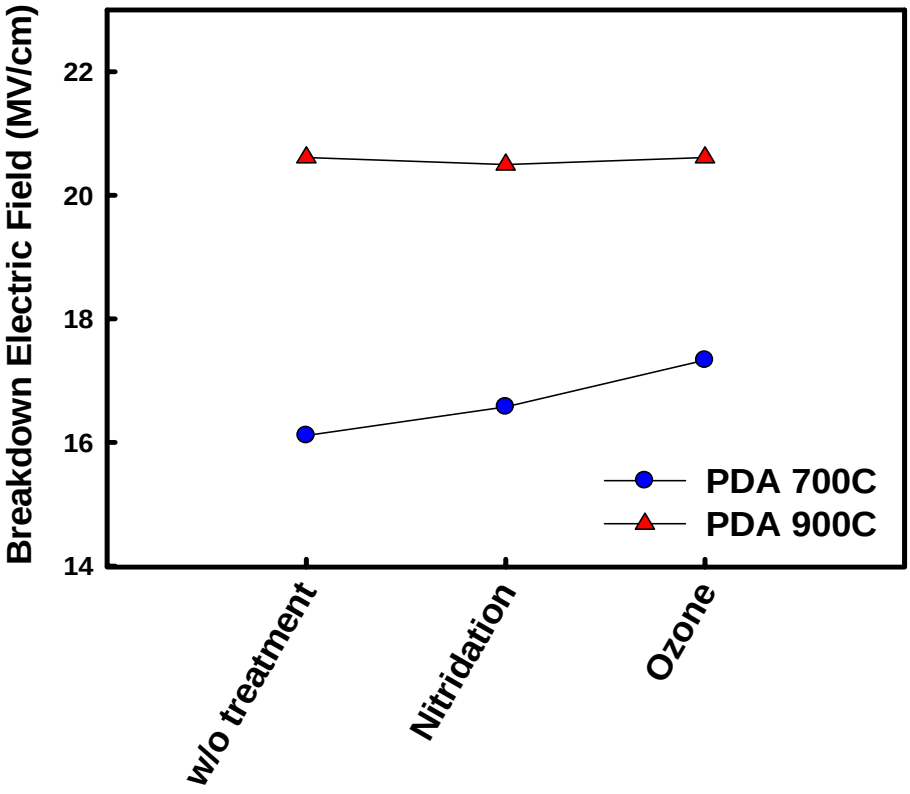


Fig. 3-15: Breakdown characteristic for all samples

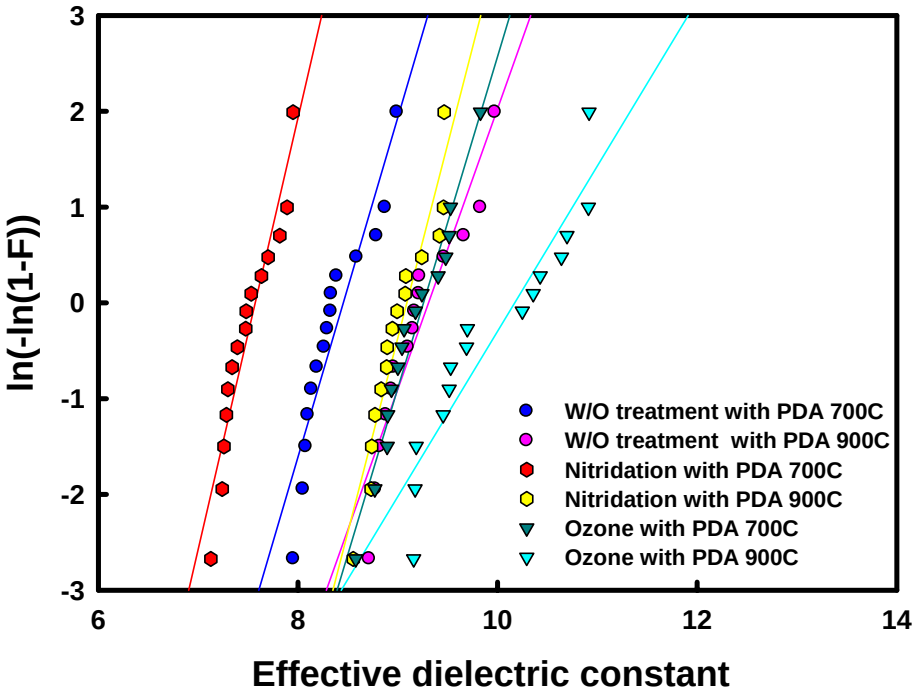


Fig. 3-16: Weibull plots of Effective k value for various surface treatments

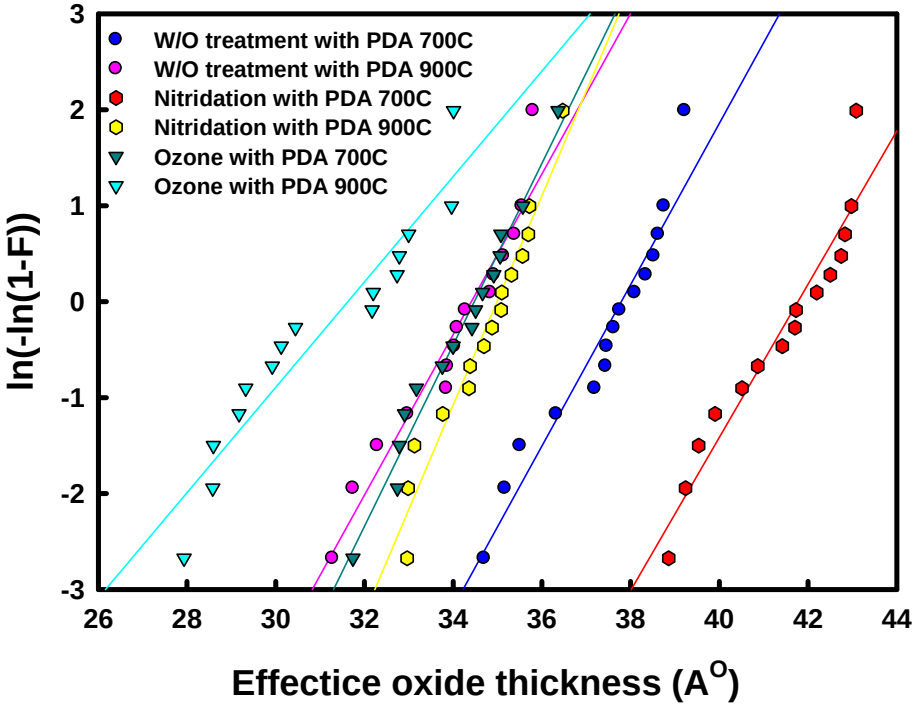


Fig. 3-17: Weibull plots of Effective oxide thickness

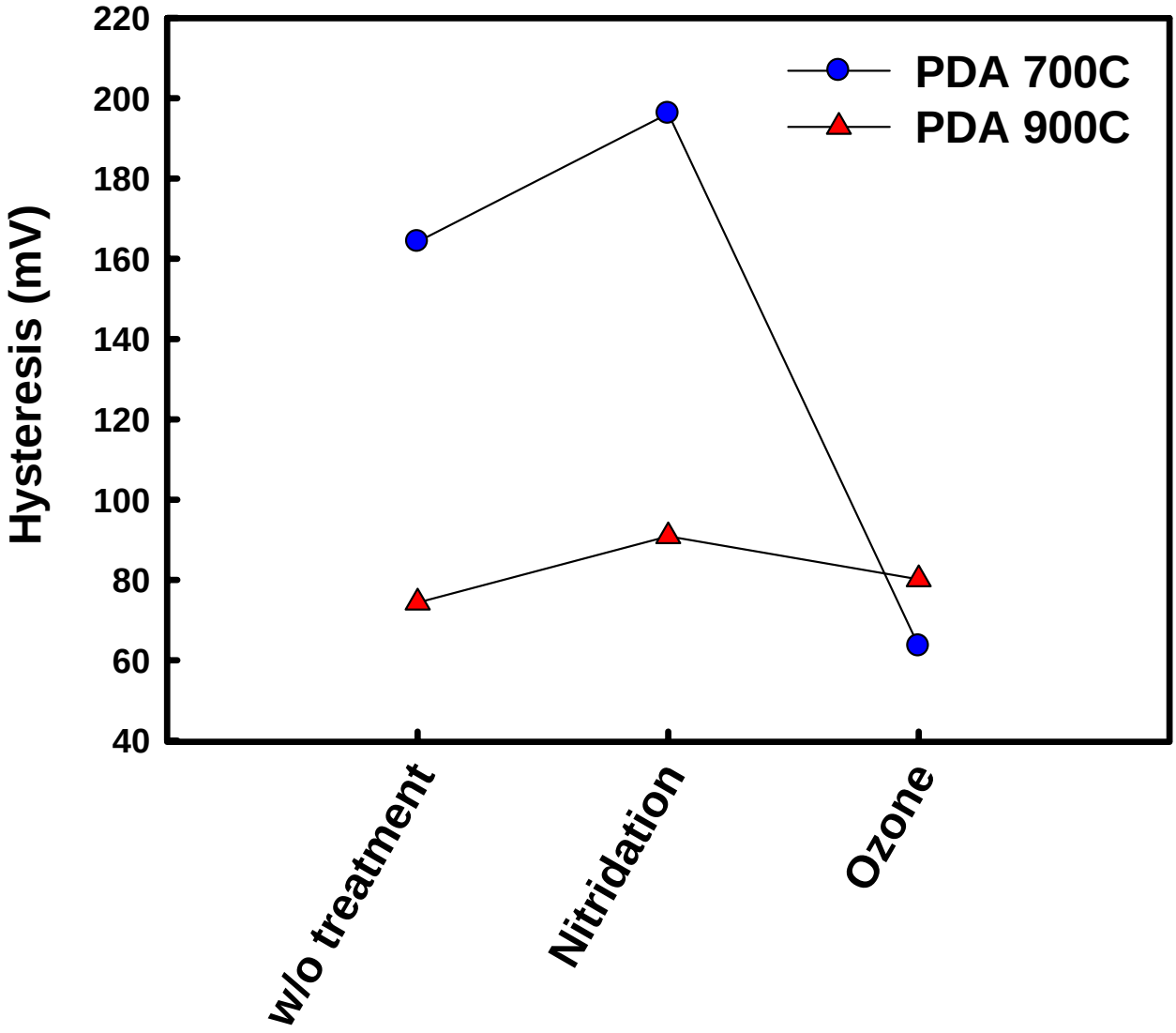


Fig. 3-18: Hysteresis characteristic for all samples

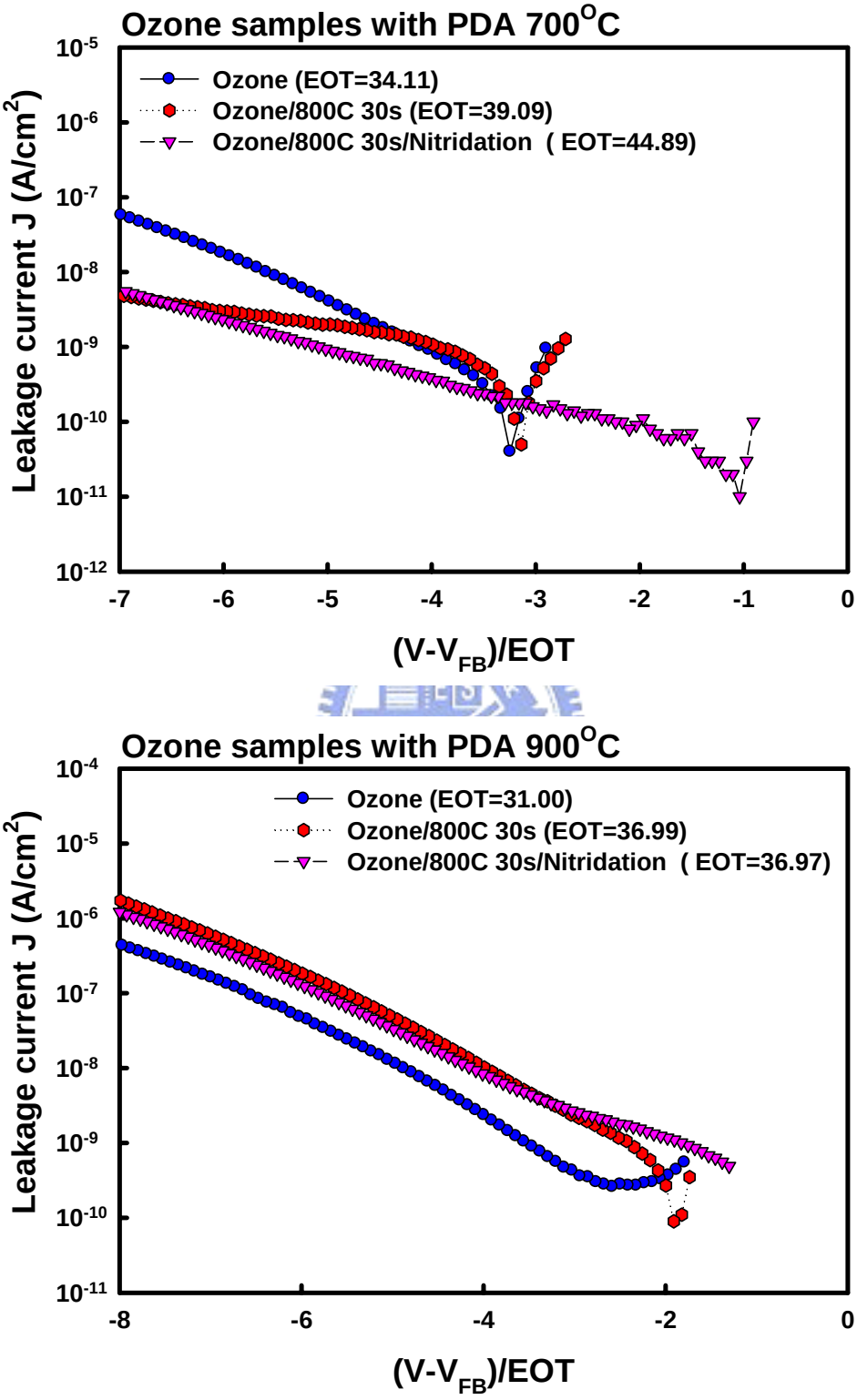


Fig. 3-19: Leakage current density versus electric field for various ozone treatments

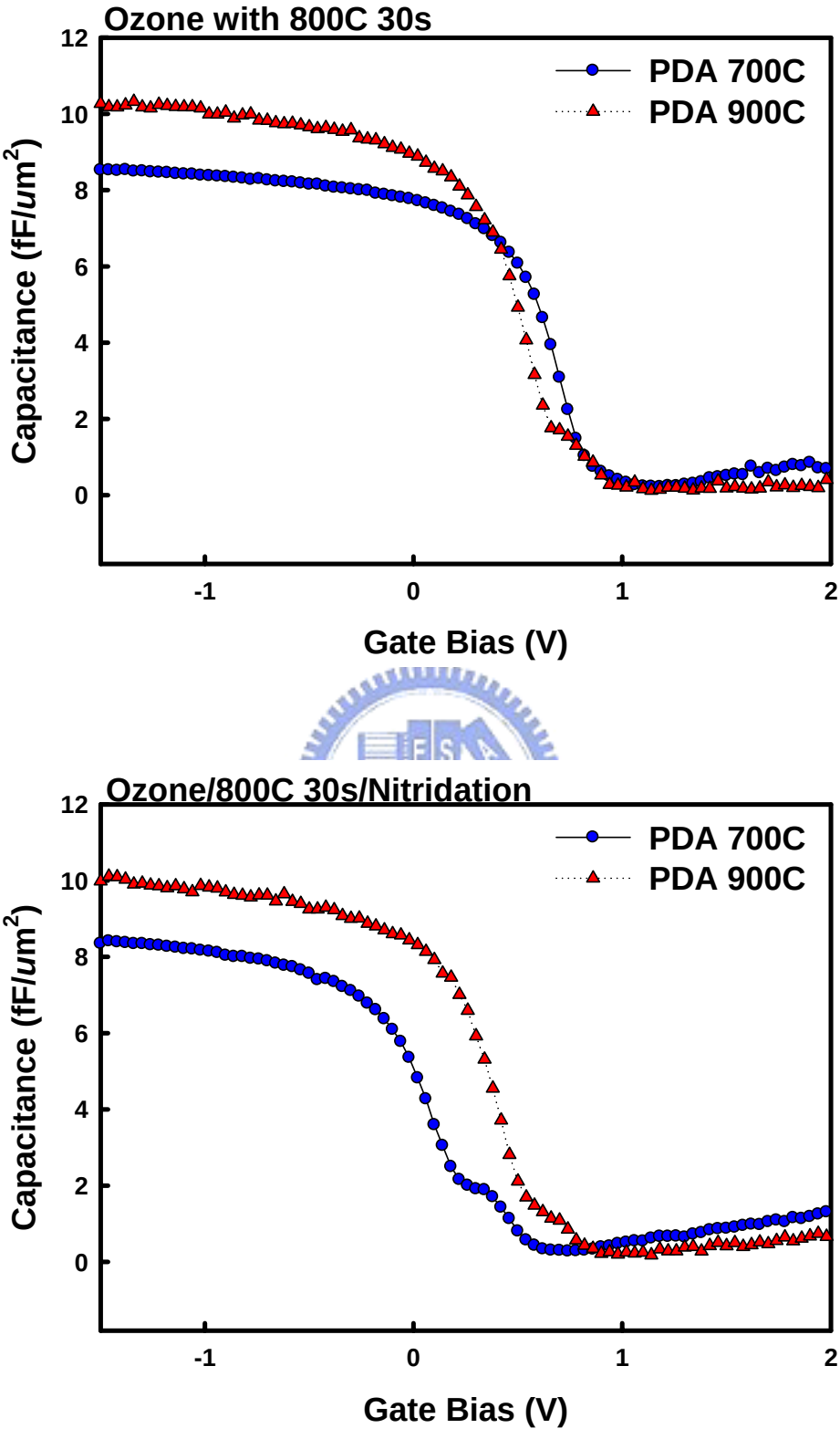


Fig. 3-20: The C-V curve for various ozone treatments

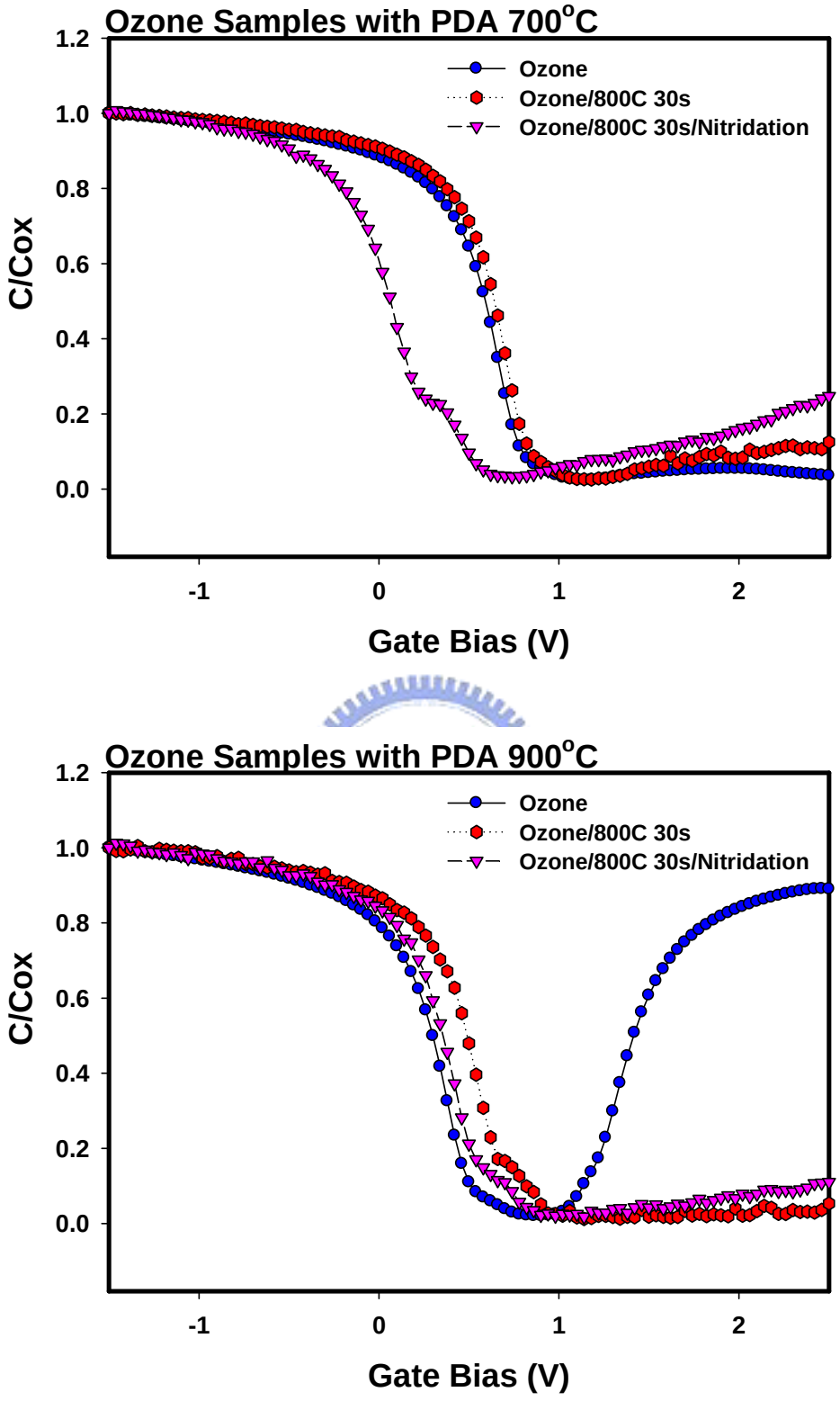


Fig. 3-21: The C/Cox curve for various ozone treatments with PDA 700˚C and PDA 900˚C

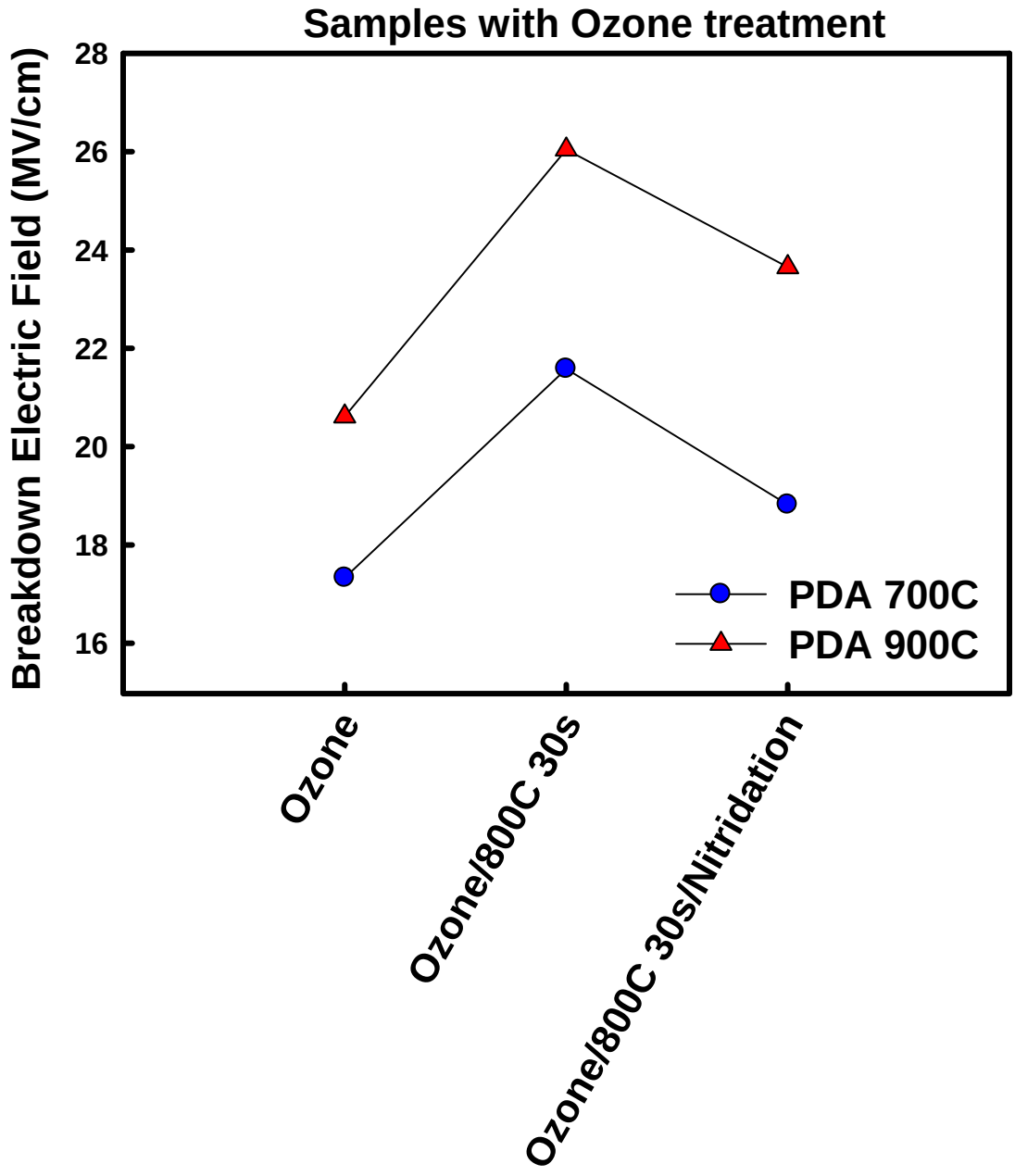


Fig. 3-22: Breakdown characteristic for various ozone treatments with PDA 700˚C and PDA 900˚C

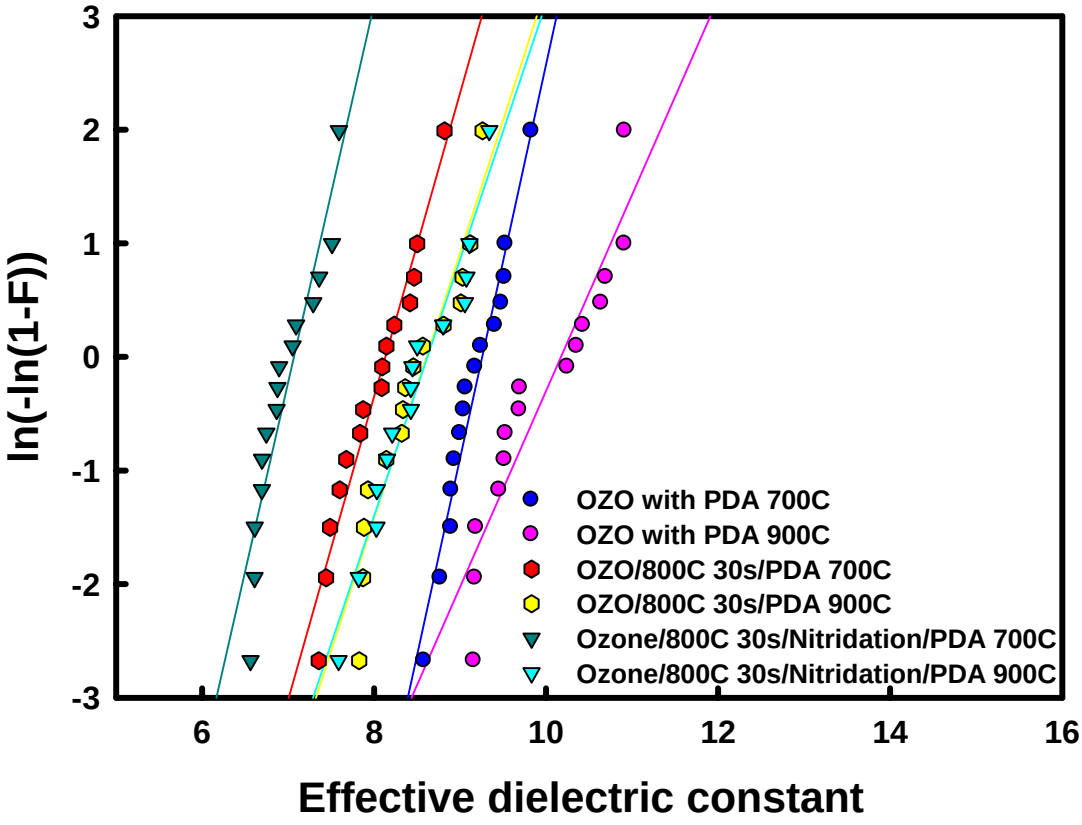


Fig. 3-23: Effective dielectric constant for various ozone treatments with PDA 700°C and PDA 900°C