GENERAL CONCLUSION

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A DC- Magnetron Sputtering unit was designed and successfully operated with a low DC-current (cold cathode) glow discharge using Ar and He gases .

The electrical characteristics of the DC- glow discharge were studied e.g. :- the I-V characteristic curves , the V-P curves , the potential distribution and the electric field distribution along the discharge . The I-V characteristic curves confirmed that the electric discharge was mainly in the normal glow discharge region ($I_a \leq 10$ mA) in the pressure range of (2-4 mbar) , while at lower pressure the discharge can be described to be subnormal glow discharge ($I_a \leq 2$ mA). It is concluded that , the breakdown voltage was found to be decreased by increasing the gas pressure at constant discharge current .

The potential distribution defined accurately the thickness of the cathode fall region (d_c) . "d_c" was about 1-3 mm. depends upon the gas pressure (P) . The data agree fairly with the theoretical relation between d_c and P . The axial electric field distribution confirmed the presence of higher field at the cathode fall region , which decreases sharply towards the negative glow and the positive column regions . In the positive column region , the electric field was weak and nearly constant . The strong electric field in the cathode fall region accelerates the electrons inward the glow discharge .

In order to define the optimum conditions of DC- glow discharge , the parameters of the formed discharge were measured accurately . The electron temperature T_e , the plasma density N_e , the electron energy

measurements , therefore , the DC- glow discharge was considered to be a partially ionized gas .

The plasma models in the three different regions of the glow discharge were discussed . It is found that , the plasma formed in the positive column region for Ar and He gases is in Steady State Corona model .