The sputtering is done by following ways :

(a) D.C. Diode sputtering,

(b) Reactive sputtering

(c) D.C. Triode sputtering

(d) Radio Frequency sputtering

(e) Magnetron sputtering.

(f) Ion beam sputtering.

(g) Ion plating

(h) Ion Implantation.

(a) D.C. Diode Sputtering :

In D.C. Diode sputtering system the sputtered target is used as a cathode and substrate holder, on which the sputtered material is being deposited is connected to the ground anode. Inert gas argon is used between target and substrate, the ions which are created in the ionization process at the edge of the cathode dark space are accelerated by cathode voltage bias to cathode target and performed sputtering.

In D.C. Diode sputtering, the reactive gas impurities such as O_2, N_2, H_2O and CO_2 impinge on all free surfaces in the volume, including the substrate and the film which

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form on it. These gases also tends to create negative ions which bombard the film and forms oxide, carbide and nitrite impurities in it. For these reasons, the substrate with the deposited film is not left at anode potential but at a floating potential. This potential will repeal the negative ions of the impurities and it will be subjected to bombardment by the positive ion of the inert gas, as a result the film is effectively cleaned of impurities.

The disadvantage is that it has low decomposition rate, the high working pressure which does not ensure sufficient purity of the film and the high anode voltages which damage the film. This method can not be used for direct sputtering of insulator and dielectric mateials. Fig.(3.2a). The technique Fig. (3.2b) employed by Maissel and Schaible[122] is called bias sputtering. The idea of sputter deposition with simultaneous sputter cleaning by bombardment was originally conceived by Frerichs [123] and his arrangement is shown in Fig.(3.2c). Hence, an asymmetric alternating rather than direct current is applied between cathode and substrate so that more material is deposited on one half cycle than is removed by reverse sputtering in the other half cylce. Bombardment removes not only the observed gases / yielding a pure film, but also the initial oxide layers which are responsible for good bonding of the film, good bonding may be retained by precoating

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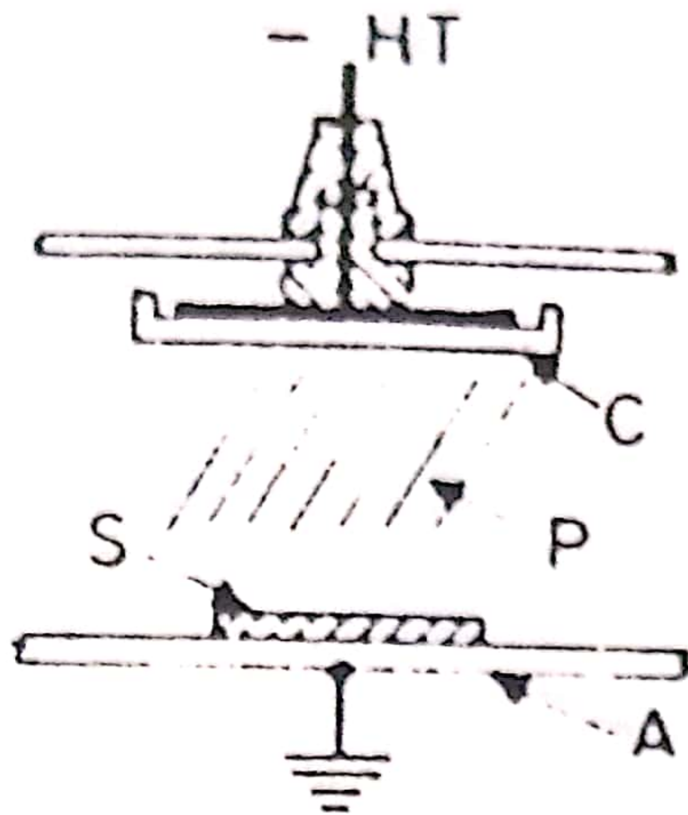

(a)
GLOW DISCHARGE

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