ACTIVATED REACTIVE EVAPORATION

Activated reactive evaporation follows the same principle used in reactive sputtering: a glow discharge is used to dissociate a gas into reactive components (see Chapter 2) which then combine with the growing film. Films of $Y_2 O_3$, TiN, TiC, VC, ZrC, HfC, NbC and TaC (and doubtless many others more recently) have been deposited at high rates (3–12μm/minute) by evaporating the metal in a partial pressure of a few times 10^{-4} torr of O_2, N_2, or $C_2 H_2$. Coupled with high substrate temperatures, extremely durable coatings can be produced.

The configuration for activated reactive evaporation is shown in Figure 6-75. With the application of a field between the source and substrate, an activated reactive ion plating process could also be produced. The structure of thick coatings has been analyzed by Movchan and Demchishin (1969), who classify the structure of coatings into three zones according to the substrate temperature T and the melting point T_m of the coating. The first two zones are divided by $T/T_m = 0.3$, with the transition to the third zone taking place at higher temperature. Many desirable film qualities are achieved at higher temperatures.

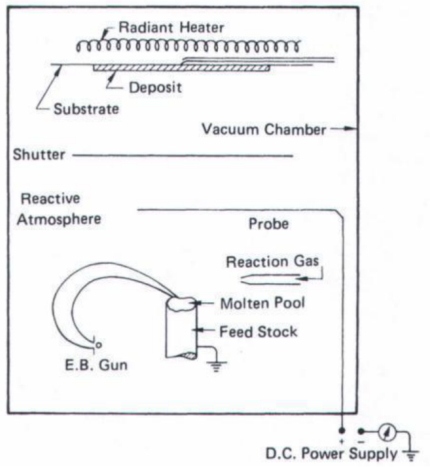

Figure 6-75. Schematic of the experimental arrangement for the activated reactive evaporation process (Bunshah 1974)