ES10.

A MODEL FOR THIN FILM GROWTH AT LOW TEMPERATURES

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There are a variety of techniques available for depositing thin solid films. The level of uniformity of the depositing flux at the interface varies with the technique as well as the geometry of the source/substrate arrangement for a given technique. Once a depositing atom makes an initial contact with the substrate the surface rearrangement mechanisms are responsible for moving the ad-atom around its neighborhood before eventually settling it on to a particular site.

A growth model is proposed and solved to represent thin film growth at low temperatures. The model assumes that the probability of a given atom reaching any site of the growing interface is independent of time or the location of the site. This corresponds to a uniform depositing flux. The model also assumes that once a depositing atom reaches a site on the interface it gets incorporated into the film at that site. Surface rearrangement mechanisms are assumed to be inactive as is expected at low temperatures..

An expression is derived for the *area coverage* $A_n(t)$ of the nth layer as a function of depositing time t. Results show that initially $A_n(t) \sim t^n$. At later times $A_n(t)$ approaches unity as expected.

By means of a suitably designed experiment, it is possible to verify these predictions. The results can also be used to test computer programs that are developed to represent more realistic growth.