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INTERNAL PROBLEMS OF THIN FILM DEPOSITION FROM GAS PHASE

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Many processes taking place in the modern technology are related to deposition of thin solid films from the gas phase (e.g. manufacture of thin films for microelectronics and optics, production of covered catalyst particles, deposition of protection films). The model describing the deposition process must take into account the joint effect of transfer phenomena and surface processes occurring at the interface between condensed and gas phases. The paper deals with internal problems of thin film deposition from the gas phase. The uniform film deposition onto the inner surface of the cylindrical channel in the free molecule region is considered on the basis of the molecular-kinetic theory. The cases of physical and chemical deposition are considered.

It is shown that for the uniform deposition of thin film onto the inner surface of the cylindrical channel the certain temperature distribution along the channel wall must be formed. The equations for such temperature distribution are obtained both for physical and chemical deposition. The temperature distribution along the channel leading to the uniform deposition sufficiently depends on kind of the deposition process. In the physical deposition with symmetric conditions when the pressure of the deposition component is equal at both ends of the channel the temperature distribution leading to the uniform deposition has a minimum in the centre of the channel. In the chemical deposition the temperature distribution leading to the uniform deposition depends sufficiently on the ratio of the activation energy of heterogeneous chemical reaction and the desorption energy of reactant molecules.

Some problems related to the foreign molecule trapping by the film deposited on the channel wall are also discussed.

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