FORMATION OF A NANOLAYER OXIDE FILM ON THE Mo(110) SURFACE

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S u m m a r y

The process of formation of an oxide layer on the Mo(110) surface is investigated using the techniques of molecular beam (MB), temperature-programmed desorption (TPD), and Auger-electron spectroscopy (AES). It is established that this process consists of two stages: the fast and slow ones are characterized by exposures close to 100 L and those of the order of 10^4L, respectively. At the first stage, a chemisorbed monolayer of oxygen atoms is formed. In this case, the TPD spectrum includes only atomic oxygen and inessential traces of oxides with a maximum at 2000 K. An oxide nanolayer starts to be formed after the end of the first stage, and only a small share of O_2 molecules incident to the surface (according to estimations, 10^{-8}–10^{-5} depending on the sample temperature) takes finally part in the formation of oxide molecules. The rate of formation of the oxide film grows, as the substrate temperature increases from 300 to 1000 K. At exposures $\geq 10^5$ L and a sample temperature of 900 K, we managed to form up to 4 oxide monolayers. This process goes on and shows no signs of complete saturation. In the TPD spectrum of the formed layer, one observes MoO, MoO_2, and MoO_3 oxides, whose peaks are located close to 1500 K, as well as a peak of atomic oxygen accompanied by a very insignificant oxide peak at 2000 K. The analysis of the TPD spectrum has revealed the first order of the desorption reaction, which testifies to the desorption of "ready" compounds, rather than their formation in the process of desorption with increase in the temperature. The presence of an oxide layer on the surface of the sample is also confirmed by the attenuation and bifurcation of the LMM Auger-peak of molybdenum.