Abstract

In the present work the results of an experimental study on the inital stages of aluminum oxidation are reported.

Despite a long-standing theoretical and experimental effort, this process still presents some puzzling characteristics. Among them, the direct, activated character of the chemisorption process: the initial sticking coefficient S_0 is approximately 1% for thermal molecules, E_i = 0.025 eV, but rises to 90% at E_i = 0.9 eV.

This findings are at variance with the results of recent *density functional theory* calculations, predicting near unity reaction probability, even at low E_i. In an attempt to clarify the dynamics of the initial stages of the oxidation process, I investigated the O_2/Al interaction by means of molecular beam and laser spectrometric techniques (resonantly enhanced multiphoton ionization - REMPI). The results of the present work, coupled to the finding of *scanning tunneling microscopy* investigations performed by A.J. Komrowski and A.C. Kummel of the University of California, provide compelling evidence for the existence of an abstractive pathway for the dissociation of oxygen on aluminum.

The REMPI study also allowed to highlight the dependence of the abstraction coefficient on both the translational and rotational energy of the incoming oxygen molecules.