444 Surface Science 109 (1981) 444–450
North-Holland Publishing Company

LEED MEASUREMENTS OF THE SURFACE DEBYE TEMPERATURE FOR THE (110) NICKEL FACE

S. MRÓZ and A. MRÓZ *

Institute of Experimental Physics, University of Wroclaw, ul. Cybulskiego 36, PL 50-205 Wroclaw, Poland

Received 20 August 1980; accepted for publication 18 March 1981

Measurements of the surface Debye temperature for the (110) nickel face were performed in such a manner that difficulties in the interpretation known from the literature seem to have been avoided. A specular beam could reach a fluorescent screen for incidence angles $30° < \beta < 70°$. A strong (00) beam was observed for $\beta \approx 60°$ and electron energy $E = 100-110$ eV. For this beam, the dependence of its intensity on the sample temperature was measured and the effective Debye temperature was calculated to be equal to not more than 216 ± 10 K. Owing to the large β, the penetration depth of electrons should be equal to about 1.2 Å and only the first layer of atoms is responsible for diffraction in this case. Besides, it is shown that single scattering processes are dominant in our experimental conditions. So, the effective Debye temperature measured should be very close to the surface Debye temperature.

Surface Science 109 (1981) 451–481 451
North-Holland Publishing Company

ELECTROMAGNETIC EFFECTS ON A MOLECULE AT A METAL SURFACE

I. Effects of nonlocality and finite molecular size

G.W. FORD

Department of Physics, The University of Michigan, Ann Arbor, Michigan 48109, USA

and

W.H. WEBER

Physics Department, Research Staff, Ford Motor Company, Dearborn, Michigan 48121, USA

Received 13 January 1981

The electromagnetic effects on a molecule near a metal surface are considered with the view to understanding the surface-enhanced-Raman-scattering (SERS) effect. The image enhancement effect is calculated including the nonlocal response of the metal and finite molecular size. The effect is much reduced ($\times 10^{-5}$) from that for a point molecule above a local metal but can still give a gain $\approx 10^3$. The power emitted by a dipole above a smooth surface is also calculated. For an Ag surface the power emitted in the form of photons, surface plasmons, and electron–hole excitations are found to be in the ratio $1 : 3 : 10^6$. The numerical results are calculated using the semi-classical infinite-barrier model of the metal surface with a Lindhard dielectric function modified to take into account finite electron lifetime and core polarization.