Reconstructions of GaAs(001) Surface investigated with Noncontact Atomic Force Microscopy

J. J. Kołodziej, B. Such

Marian Smoluchowski Institute of Physics, Jagiellonian University, ul. Reymonta 4, 30 059 Kraków, Poland

For ion–beam sputtered GaAs (001) surface, depending on the processing temperature, different surface reconstructions are obtained. If the surface temperature is below 850 K, a typical reconstruction is disordered (1x6). Around the temperature 860 K, the pseudo(4x6) reconstruction is obtained. In the processing temperature window 870 – 900 K the complex c(8x2)/G(4x6) surface is observed. In the present paper noncontact atomic force microscopy (NC-AFM) is used to study GaAs (001) surface having several different reconstructions. It is shown that thanks to the easy control of the tip surface distance offered by the NC-AFM one may separate electrostatic and chemical interaction parts and identify both the features of structural and the features of electronic origin.

Variations of the Local Electrostatic Field at a Metal Surface: Calculations *versus* Experiments

P. P. Kostrobiy[a], B.M. Markovych [a], Y. Suchorski[b]

[a] *Lviv National University of Technology, Stefan Bandera str.12, UA-79013 Lviv, Ukraine*

[b] *Chemisches Institut, Otto-von-Guericke-Universitt Magdeburg, Universittsplatz 2, D-39106 Magdeburg, Germany*

Electron density distribution characteristic to the particular metal surface can be significantly modified by an externally applied electrostatic field of the order of tens volts per nanometer. This externally induced modification of the surface electron density results, in turn, in an adjustment of the local electrostatic field at the subnanometer-distances to the surface [1]. Since the different metals possess differing electronic distributions which, in addition, respond differently to the applied field, the resulting spatial local field distribution should be therefore distinctive for particular metals, even for flat or similarly structured surfaces.

Field-free and field-modified electron density distributions at the various metal surfaces were calculated using the functional integration method [2]. This approach allows to consider correctly the exchange-correlation effects and makes possible the proper field-effect account for broad field ranges without to use the perturbation theory.

The results of our calculations are compared to the field-ion microscopic measurements of local electrostatic fields in the immediate vicinity of individual surface atoms. The implications of the obtained results on the particular fields of nanotechnology and heterogeneous catalysis, such as fine tuning of the surface reactions are discussed.

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[2] P.P.Kostrobiy, B.M.Markovych, Condensed Matter Physics, 6 (2003) 347