Thermal stability of atomic Ag/Au and Au/Ag interfaces on A Ru(001) substrate

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The existence of localized phonons within two different slabs adsorbed on a substrate is reported here. A closed form expression giving the frequencies of these phonons as function of the propagation vector parallel to the interfaces was obtained within a simple model. This expression is also a function of the respective force constants and masses and depends on the number of atomic layers present in each slab. A few specific examples illustrate this result. A comparison is made also with the sandwich phonons, localized phonons within a slab situated between two semi-infinite crystals.

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LANDAU LEVELS AND SdH-OSCILLATIONS OF THE QUASI TWO-DIMENSIONAL ELECTRON GAS AT GRAIN BOUNDARIES AND NEAR HETEROJUNCTIONS

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For the quasi two-dimensional (Q2D) electron gas important experimental information is obtained from magnetotransport measurements with a perpendicular magnetic field. The energy spectrum consists of series of Landau levels for each electric subband. There still exist several open questions if two or more electric subbands are populated. Results are presented here for this situation. The usual procedure for interpreting Shubnikov–de Haas (SdH) measurements for the case of several populated subbands is analyzed (connection with the saw-tooth like Fermi energy as a function of the magnetic field). The transverse magnetoresistance is calculated for the Q2D electron gas in InSb-bicrystals and at InGaAs–InP heterojunctions. All details of the experimental curves can be explained including an anomalous behaviour of the quantum Hall effect (QHE) in the second system. Basic assumptions of the theory are the broadening of the Landau levels and in addition a background of localized states in the second case. The dependence of the electronic structure on the perpendicular magnetic field is discussed qualitatively. First results of magnetic field dependent self-consistent calculations for inversion layers are presented. It is shown for the first time that this magnetic field dependence causes qualitative changes of the Landau level spectrum.

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THERMAL STABILITY OF ATOMIC Ag/Au AND Au/Ag INTERFACES ON A Ru(001) SUBSTRATE

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The thermally activated intermixing in Ag/Au and Au/Ag bilayers supported on a Ru(001) substrate has been studied using the PAX-technique (photoemission of adsorbed xenon). It is found that the Ag/Au interface (on Ru) is thermally more stable than the Au/Ag interface. In the first case Ag atoms do not penetrate into the Au underlayer at 275 K, while in the second case Au atoms do penetrate into the Ag underlayer at this temperature. These investigations also represent a very successful model study which may be carried over the other metal/metal combinations.

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THEORY OF INTERFACES BETWEEN DISCRETE AND CONTINUOUS MEDIA – APPLICATION TO TRANSITION METAL SURFACE STATES **A. AKJOUJ, L. DOBRZYNSKI**

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A general theory of response functions for partly discrete and partly continuous composite systems is given. It is then used for the study of the influence of work function and tunneling on transition metal surface states. It is shown on a simple model that when account is taken of the work function, localized surface states may appear above the bulk band. A composite system formed out of a thin vacuum slab sandwiched between two identical transition metal surface (tunnel junction) is then considered. It is found that each surface state is split in two, having slightly different energies.

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INTERFACE ELECTRONIC STRUCTURE OF THE KBr–RbCl CONTACT (LCAO SLAB CALCULATIONS)

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The electronic structure of thin layers of KBr and RbCl was calculated using the LCAO method within the next-nearest-neighbour approximation. The parameters were chosen to fit the experimental values of the energy gap and the valence bandwidth of these crystals. Then the model of the KBr–RbCl contact was constructed and investigated. Its electronic structure presented in the two-dimensional Brillouin zone was compared with those for KBr and RbCl thin layers. No interface states have been found, and the observed properties of the KBr–RbCl contact have been attributed to the displaced positions of the bottom of the conduction bands at the interface.