equation [4] connecting E with T_e, derived for the case of relaxation by polar optical oscillations.

From the point of view considered here, interest attaches to solid solutions of semiconductors (Ge-Si, various III-V semiconductors), in which variation of the composition makes it possible to choose ε_d such as to realize case (B).

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ORDER-DISORDER TRANSITIONS IN ADSORBED MONATOMIC SODIUM FILMS

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An experimental study of the disorder processes in two-dimensional systems is of interest in connection with the role that they can play in various surface phenomena, and also because it is possible to construct for this case a more rigorous phase-transition theory than for a three-dimensional lattice [1].

By slow-electron diffraction [2], we have observed and investigated order-disorder transitions in sodium films adsorbed on the (110) face of a tungsten crystal. The films were sputtered on the crystal in ultrahigh vacuum ($p < 10^{-10}$ Torr). The technology of obtaining and purifying the sodium is described in [3]. The surface concentration of the adsorbed sodium atoms n_{Na} was determined from its known dependence on the work function of the surface [3]. Since we wished to consider the purely two-dimensional case, we investigated coatings which were certain to be thinner than the close-packed monatomic layer.

Figure 1 shows a series of diffraction patterns corresponding to various sodium concentration. The sputtering of the sodium leads to the appearance of a number of additional (fractional) reflections on the electron diffraction pattern (Figs. 1b - 1d). It is important to note that ordered films are produced when the sodium is sputtered on a crystal cooled with liquid nitrogen, without additional annealing (the sputtering rate was $\sim 10^{12}$ at/cm^{2}sec).

An analysis of the pictures on the basis of the kinematic theory leads to a film structure (Fig. 2) in which the ratio of the number of sodium atoms to the number of surface tungsten atoms n_{Na}/n_W amounts to 1.6, 1.4, and 1.3. The correctness of the analysis of the diffraction patterns is confirmed by the fact that the sodium-atom concentrations for which the corresponding structures are observed are in full agreement with the indicated ratios n_{Na}/n_W (for the (110) face of tungsten, $n_W = 14.1 \times 10^{14}$ cm^{-2}).

Figure 3 shows plots of the additional-reflection intensity against the temperature for the indicated structures. It is clear from Fig. 3 that for each type of structure there is a rather narrow temperature interval in which the reflection intensity, together

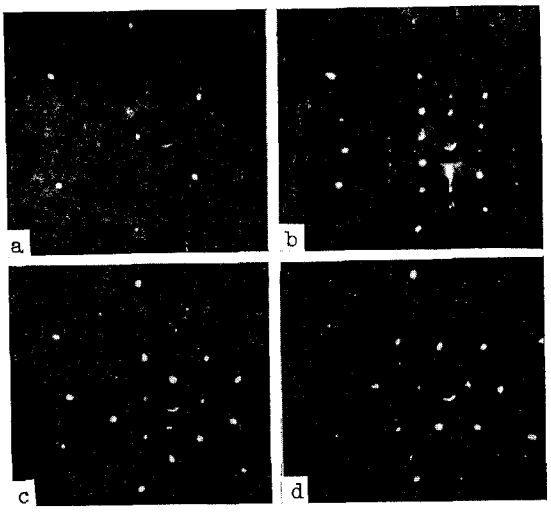

Fig. 1. Diffraction patterns: T = 78°K, electron energy U = 73 eV. a) Pure W, face (110); b-d) W coated with Na, n_{Na} (in units of 10^{14} cm^{-2}): b) 2.4 ($n_{Na}:n_W$ = 1.6, c(3.5 (1.4), d) 1.7 (1.3).

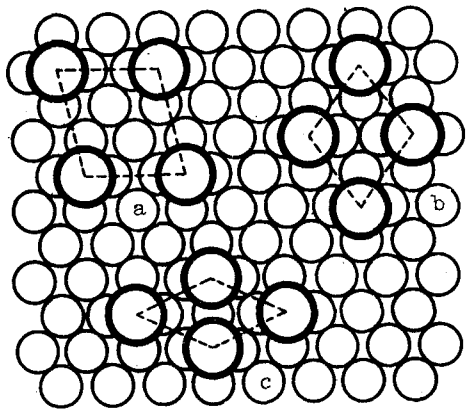

Fig. 2. Unit cells of sodium film structures: a) $n_{Na}:n_W$ = 1:6, b) 1:4, c) 1:3.

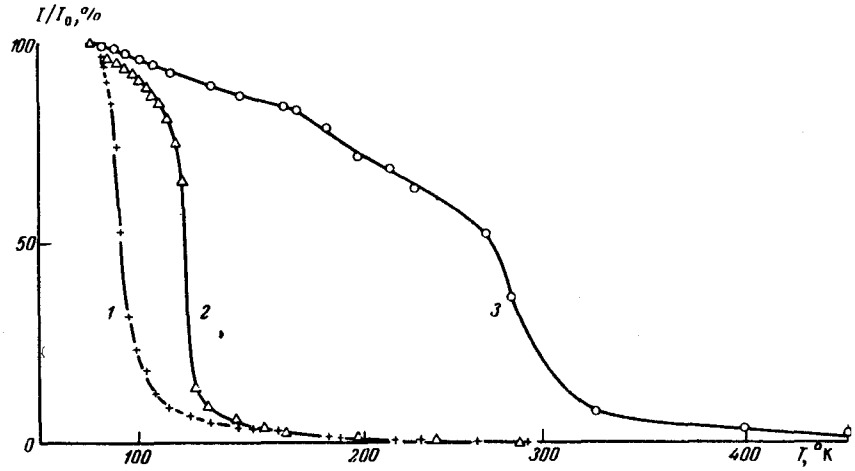

Fig. 3. Temperature dependence of relative intensity of additional reflections for the structures: 1)1:6, 2) 1:4, 3) 1:3. I_0 - intensity at 78°K. U = 27 eV.

with the degree of far order in the arrangement of the sodium atoms, changes strongly. After the films become disordered, all that remains on the diffraction patterns are the reflections from the tungsten (Fig. 1a) with a slightly increased background. The order-disorder transitions can be reproduced many times for the same sputtered film.

The following noteworthy facts are of importance: 1) Out of the various structures that are possible for a given n_{Na}, the realized structure is the one in which the sodium atoms occupying equivalent adsorption centers on the substrate are farthest from one another. 2) The denser the adsorbed film, the higher the order-disorder transition temperature. 3) Measurements of the work function (by the contact potential difference method) show that when the long-range order of the described structures is destroyed, the surface work function remains unchanged within the limits of the experimental accuracy ($\lesssim$ 0.05 eV).

It can be assumed that, in the formation of two-dimensional lattices with large

periods, an important role is played by long-range forces connected with the fact that the adsorbed sodium atoms have an appreciable positive charge [4]. Thus, a study of phase transitions in monatomic films can yield new data on the electronic properties and on the interaction of adsorbed atoms. On the other hand, the possibility of changing the surface concentration of the adsorbed atoms in a wide range, and of using substrates with various structures, makes such films convenient for the verification of theoretical models of phase transitions.

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INFLUENCE OF "INDUCED" ANGULAR MAGNETIC STRUCTURE ON THE MAGNETOSTRICTION OF DYSPROSIUM IRON GARNETS

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It was shown theoretically in [1-4] that a noncollinear angular magnetic structure may be produced in ferromagnets in a certain interval of magnetic fields ($H_1 < H < H_2$). This structure is produced as a result of competition between the exchange interaction, which tends to produce an antiparallel orientation of the sublattice magnetic moments, and the external field, which tends to turn both sublattices parallel to the external field.

A convenient object for the investigation of angular structures "induced" by the magnetic field are rare-earth iron garnets (REIG). They can be described approximately within the framework of the two-sublattice model with strong exchange interaction inside the resultant iron sublattice, with a relatively weak negative interaction between the iron and rare-earth sublattices, and with a negligibly small interaction inside the rare-earth sublattice [5, 6]. The temperature dependences of the critical fields H_1 and H_2 of REIG were calculated by the molecular-field approximation in [4], where it was shown that the angular structure can exist only below a certain temperature T_{cr}, and that only collinear structures exist above this temperature. For REIG with a compensation point the critical temperature is somewhat lower, but is close to the compensation temperature θ_c.

Calculations show that at helium temperatures the critical fields of most REIG exceed 500 kOe. Near the compensation point, H_1 and H_2 decrease greatly, but the singularities on the magnetization isotherms become barely noticeable in such fields, owing to the masking effect of the paraprocess. These experimental difficulties explain the