Y. G. Ptushinskiĭ, A. G. Naumovets, and O. A. Panchenko, *Electron-Adsorption Phenomena on the Surface of Metal Single Crystals.* Physics of surfaces is one of the most intensively developing branches of solid-state physics. It provides the scientific basis for such important areas of technology as catalysis, protection of metals against corrosion, electronics, vacuum techniques, and so on.

The development of ultrahigh-vacuum technology and of a complex of powerful experimental techniques has provided the means whereby experiments can now be carried out with atomically pure surfaces and accurate information can be obtained on the atomic and energy structure of surfaces and their chemical composition.

This paper is based on a series of experiments at the Physics Institute of the Ukrainian Academy of Sciences. Physical properties of the surfaces of high-melting single crystals of metals, both atomically pure and coated with controlled submonolayer films, were investigated. The experiments were carried out in a vacuum of 10^{-11} Torr at surface temperatures between 5 and 2500 °K.

Submonolayer (i.e., "thinner" than the monolayer) films of strontium on single crystals of tungsten and molybdenum were used to obtain data on the structure and phase transitions in quasi-two-dimensional crystals. The structure of the surface and of the films was examined by the low-energy electron diffraction method.

Analysis of the observed structures has led to the conclusion that, on the close-packed (110) plane of tungsten and molybdenum, the dipole-dipole repulsive interaction between the adsorbed strontium atoms (adatoms) is the predominant interaction. Nevertheless, certain differences between the structures of strontium films on similar tungsten and molybdenum surfaces indicate that another type of force may play an important role, namely, the indirect interaction between the adatoms through the electron gas in the substrate. This type of interaction is particularly well defined in the case of adsorption on the (112) plane with anisotropic structure.

Order-disorder transitions have also been investigated for adsorbed films, and a qualitative difference has been found between the behavior of films that were matched and unmatched to the substrate. The former films become disordered in a narrow temperature band and the latter in a broad temperature band. We see this as a confirmation of the theoretical prediction that matched films have true long-range order whereas unmatched films exhibit only short-range order which is gradually reduced as the temperature increases.

The second group of experiments was concerned with the scattering of conduction electrons by the surface of a single crystal of tungsten (and molybdenum), both atomically pure and covered by submonolayer films. Scattering data were obtained by measuring the static skin effect and by examining the Sondheimer oscillations. It was found that the atomically pure (110) surface scattered the conduction electrons almost specularly, whereas the (100) surface produced practically diffuse reflection. The latter is explained by electron-hole transfers on the surface (this is a consequence of the anisotropy of the Fermi surface). Deposition of submonolayer films results in a deterioration in the specular properties of the surface, and the degree of this deterioration depends both on the nature of the deposited atoms and on the degree of order in the film.

Observations on Sondheimer oscillations can be used to obtain information on the scattering of a particular group of electrons by the surface.

I. A. Abroyan, V. V. Korablev, N. N. Petrov, and A. I. Titov, *Secondary-Emission Methods of Investigating the Structure and Composition of the Surface Layers of Solids.* Comprehensive systematic analysis of the surfaces of solids and of their surface layers (element composition, structure, electron properties, and so on)