

Abstracts of Papers Presented at
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temperature, the electric field or both. The tip temperature was extremely critical for obtaining a steady Ga ion flux. In some cases the Ga flux was sufficiently high to yield a desorption image of the surface, implying that more than 1000 Ga ions/sec are formed at each imaged site. The desorption image has a resolution comparable to that of a field ion image. Unlike ordinary desorption imaging where the surface atoms are removed, only the continuously replenished Ga atoms are evaporated and the W tip surface remains intact.

After annealing the surface at elevated temperatures we found that the field ion image showed patchy regions of a Ga and W ordered alloy structure similar to that found in Pt electroplated W.¹ The evaporation field of this surface was higher than that of Ga atoms migrating from the shank before annealing.

Below room temperature Ga atoms evaporate as doubly charged ions with a sharp energy distribution comparable to that of He field ionization within the forbidden zone.² The binding energy of Ga atoms on W can be derived from the measurement of the energy deficit of the field evaporated Ga ions.³ Since the substrate W surface remains intact, the evaporation field can be maintained at a constant value. A retarding potential analyzer with 100 meV resolution of the 2000 eV primary ion energy was incorporated in the atom probe for this purpose. The measured binding energy will be presented as a function of crystallographic orientation of the W substrate and will be discussed based on the adsorption geometry determined from a field ion image.

1. K. D. Rendulic, E. W. Mueller, *J. Appl. Phys.* **38**, 550 (1967).
2. T. Sakurai, E. W. Mueller, R. J. Culbertson, T. T. Tsong, *Proc. 7th Intern. Vac. Congr. & 3rd Intern. Conf. Solid Surfaces* (Vienna 1977), 2467.
3. T. T. Tsong, W. A. Schmidt, O. Frank, *Surface Sci.* **65**, 109 (1977).

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FIELD-INDUCED DESORPTION OF BENZENE FROM TUNGSTEN*

J. A. Panitz

*Sandia Laboratories[†], Albuquerque,
New Mexico 87185*

A study of the field-desorption properties of benzene from clean, field-evaporated tungsten surfaces is des-

cribed. Ramped-DC desorption was used to measure the desorption field of benzene at temperatures below 200 K, while Imaging Atom-Probe spectroscopy was used to determine the identity of the desorbing species in physisorbed, and chemisorbed layers. Time-gated imaging was used to follow the crystallographic behavior of the predominant physisorbed species, $C_6H_6^+$, between 55 K and 200 K.

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PROBABILITY DENSITY OF DISPLACEMENT OF ADATOM ON TUNGSTEN SURFACE

Yuji Sadakane, Ken-ichi Hirano

*Department of Materials Science,
Faculty of Engineering, Tohoku University,
Sendai, Japan*

By the FIM study of surface diffusion, it has been shown that the migration of the adatom at low temperature is restricted in the edge of the terrace. The edge of the terrace has two kinds of role in the migration of the adatom; reflecting or adsorbing boundary. The role of the edge depends on temperature and time of diffusion treatment. When the distance between the edges of the terrace is a , we define $W_N^R(d, a)$, the probability that the adatom makes a displacement d after it makes N jumps by the following equation.

$$W_N^R(d, a) = (1-k) W_N^R(d, a) + k W_N^A(d, a)$$

where the symbol R denotes the case that the adatom is reflected at the edge of the terrace and A the case that the adatom is adsorbed by the edge of the terrace, and k is the adsorbing factor ($0 \leq k \leq 1$), which depends on temperature and time of diffusion treatment. The value of k can be estimated by comparing the experimental values of $W_N^R(d, a)$ and $W_N^A(d, a)$ with the theoretical values of them. In the present work, the surface self-diffusion on the W (431) plane has been investigated theoretically and by FIM observation.