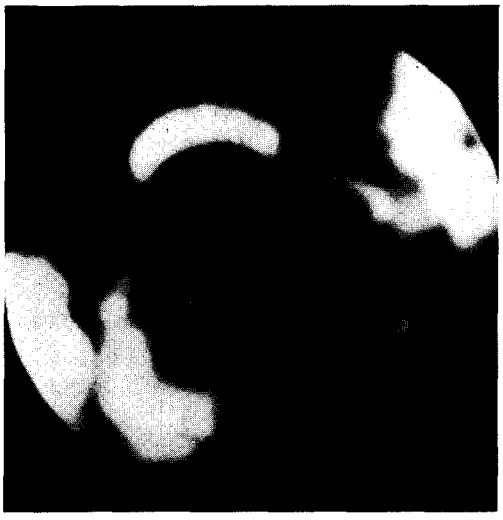

Plate 9. After heat treatment at about 1400°K for 21 minutes, $i=2.5\,\mu$A and $V=$ 6600 volts.

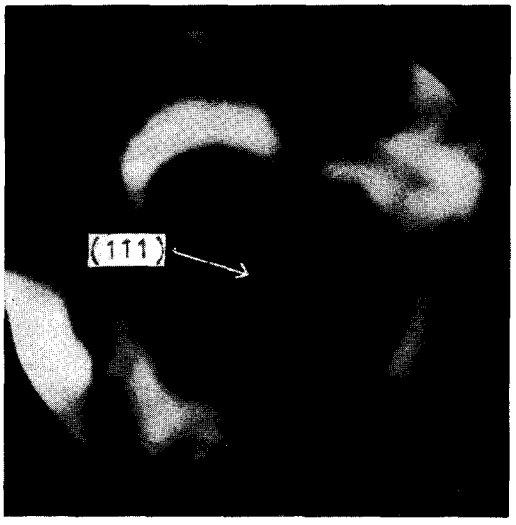

Plate 10. After heat treatment at about 1600 °K for 15 seconds, $i=2.5\,\mu$A and $V=7050$ volts.

NOTE ON THE FIELD-EMISSION MICROSCOPIC OBSERVATION OF DECOMPOSITION OF ETHYLENE ON TUNGSTEN

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The field-emission pattern of a tungsten tip of about 5000 Å radius, treated with ethylene as below, was observed with $\sim 10^5$ magnification, in a liquid oxygen filled cryostat**). Ethylene was introduced into the cell through a capillary pointed at the tip with its end 5 mm. apart from the tip. The pressure inside the cell was increased from $\sim 10^{-9}$ to $\sim 10^{-6}$ mm Hg by this procedure. This treatment with ethylene as well as the heat treatments described below were conducted without electric field.

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**) Wrinkles shown in Plates 1 to 8 were attributed to water drops condensed on the window of the cryostat, since they disappeared as the patterns were observed without liquid oxygen.

Plate 1 shows bright regions around (011)-plane of tungsten observed just after the above treatment with ethylene. The temperature of the tip was now raised to about 1550°K and then to 1950°K with the result of the emission patterns respectively of Plate 2 and Plate 3. Ethylene was now introduced again (Plate 4) and the tip was heated to about 1950°K for several minutes and more (Plates 5 and 6). The dark (334)-plane on the pattern of Plate 6 showed the known characteristic crystal plane when carbon was deposited on tungsten*). The tip was then flashed at about 3000°K; the emission pattern thus revealed the crystal plane of carbon on tungsten (Plates 7 and 8)*).

The bright region in Plates 1 and 4 might be ascribed to slightly polarised ethylene molecules ($CH_2=CH_2^{(+)}$)**).

These observations suggest that in the high vacuum of the present experiment the decomposition of ethylene on tungsten took place rather at a high temperature, presumably around 1950°K or above.

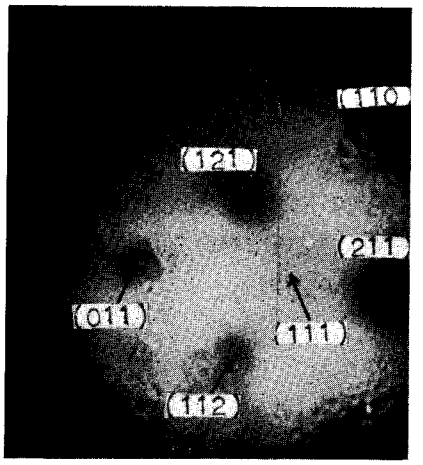

Plate 1. Field-emission pattern of the ethylene adsorbed tungsten tip, at 90°K. The emission current i was 0.65 μA and the applied voltage V was 9200 volts.

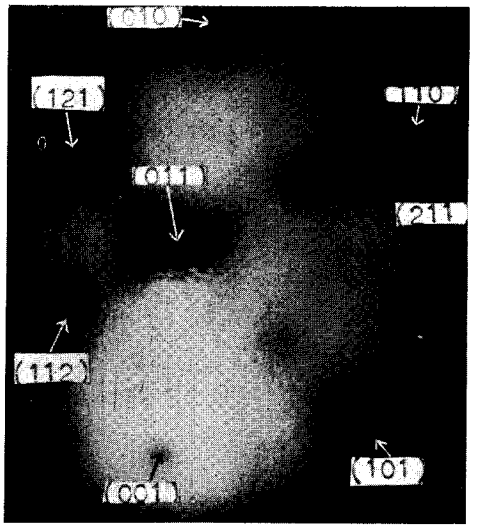

Plate 2. After heat treatment at about 1550°K, $i=0.7$ μA and $V=9000$ volts.

*) E. W. MÜLLER, Ergebniss, exakt. Naturwiss. XXVII, pp. 334–337 (1953).

) R. S. MULLIKEN, J. Am. Chem. Soc. **74, 811 (1952).
F. A. MATSEN, A. C. MAKRIDES and N. HACKERMAN, J. Chem. Phys. **22**, 1800, (1954).
J. C. P. MIGNOLET, J. Chem. Phys. **21**, 1298 (1958).

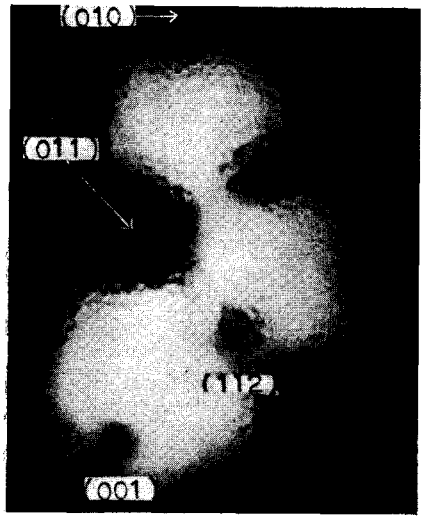

Plate 3. After heat treatment at about 1950°K, $i=0.5$ μA and $V=$ 7600 volts.

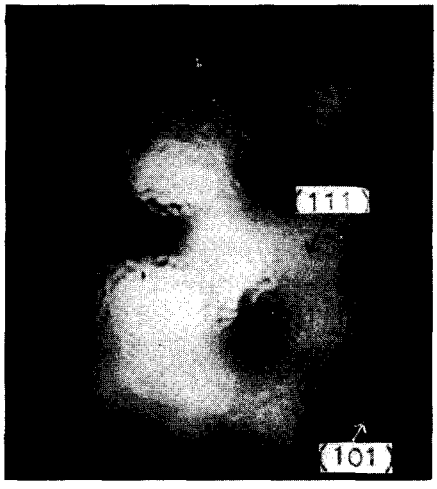

Plate 4. Ethylene was adsorbed on the tip again, $i=0.6$ μA and $V=8400$ volts.

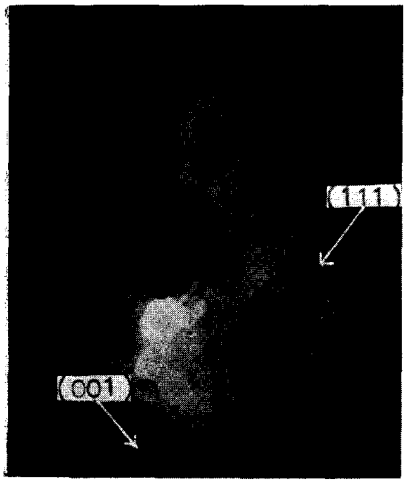

Plate 5. After heat treatment at about 1950°K for 5 minutes, $i=1.5$ μA and $V=8200$ volts.

Plate 6. After heat treatment at about 1950°K for 10 minutes, $i=$ 0.5 μA and $V=7600$ volts.

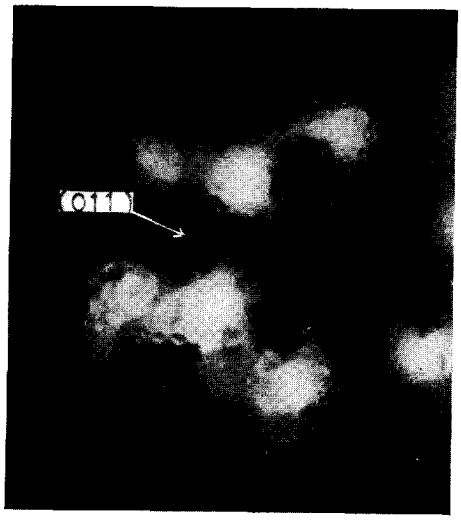

Plate 7. After a flash at 3000°K, $i=2.0$ μA and $V=8200$ volts.

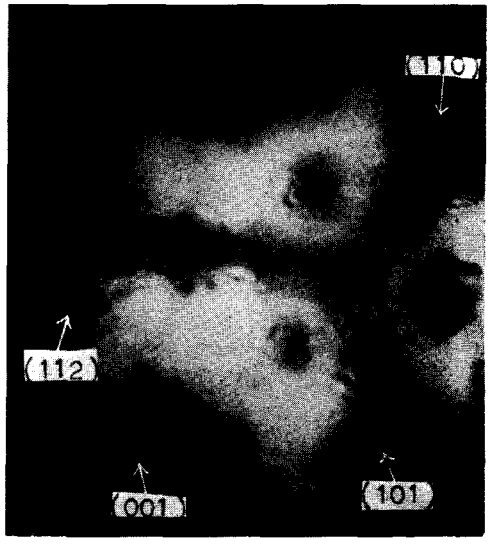

Plate 8. After several flash at 3000°K, $i=4.0$ μA and $V=8000$ volts.