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 ~10⁵ 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 ~10⁻⁹ to ~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 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.
Short Note

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 3700°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 (\(\text{CH}_2=\text{CH}_2\))\(^*\).

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.

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Plate 3. After heat treatment at about 1950°K, \( i = 0.5 \mu A \) and \( V=7600 \text{ volts} \).

Plate 4. Ethylene was adsorbed on the tip again, \( i = 0.6 \mu A \) and \( V = 8400 \text{ volts} \).

Plate 5. After heat treatment at about 1950°K for 5 minutes, \( i = 1.5 \mu A \) and \( V = 8300 \text{ volts} \).

Plate 6. After heat treatment at about 1950°K for 10 minutes, \( i = 0.5 \mu A \) and \( V = 7600 \text{ volts} \).
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.