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The external shape of antimony oxide (Sb_2O_3) formed on the cleavage surface of stibnite.

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By means of electron diffraction, Miyake (1938) has established the following facts on the growth of antimony oxide (Sb_2O_3) upon the cleavage surface of stibnite (Sb_2O_3): (i) the [110] axis of the oxide is parallel to the [001] axis of the stibnite; and (ii) the oxide grows into a protrusion having an external shape bounded by two well developed octahedral planes (111) and (11$\bar{1}$), and by less developed planes (1$\bar{1}$1) and (1$\bar{1}\bar{1}$), as shown in Fig. 1.

The latter conclusion was deduced from the study of the fine structure in the electron-diffraction pattern,

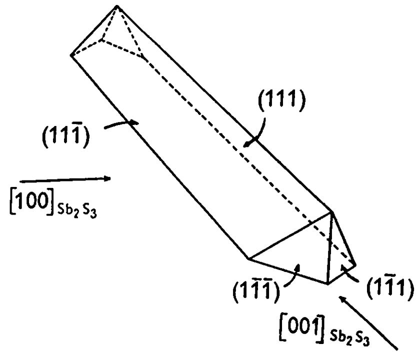

Fig. 1. The external shape of the antimony oxide deduced from electron diffraction (Miyake, 1938).

taking account of the refraction at the boundary surfaces and the external shape. It seemed interesting to confirm this conclusion directly by means of electron microscopy.

A fresh cleavage surface of stibnite was oxidized by heating in air at 280° C. for 20 min., which is, according to Miyake, the most favourable condition for this form of growth of the oxide. The oxidized surface was investigated by the replica method. A step replica (Wyckoff 1949), utilizing a solution of 1·5% nitrocellulose dissolved in amylacetate, was found to be the best. The electron micrograph obtained is reproduced in Fig. 2.

It clearly shows roof-like oxide protrusions of dimensions about 2–4 μ (length) and 0·1–1 μ (width) in relief against the flat substrate and growing nearly parallel to

Fig. 2. The electron micrograph of the roof-like oxide formed on the cleavage surface of the stibnite.

one another. This agrees well with the conclusion mentioned above. As far as our electron micrograph is concerned, however, the shape of the oxide protrusion does not seem so clean-cut as indicated in Fig. 1, showing that the top edge of the roof is somewhat round. This rounding cannot be due to the lack of faithfulness in the replica, since we can find the well defined edge at the bottom of the protrusion.

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References

Miyake, S. (1938). *Sci. Pap. Inst. Phys. Chem. Res. Tokyo*, **34**, 565.

Wyckoff, R. W. G. (1949). *Electron Microscopy.* New York: Interscience Publishers.

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An incorrect expression in the literature for the electron density in a crystal.

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The electron density at any point in the unit cell of a crystal is given, in the usual notation, by the Fourier series

$$\varrho(x, y, z) = \frac{1}{V}\sum_h\sum_k\sum_l\limits_{-\infty}^{+\infty} F_{hkl}\cos\{2\pi(hx/a+ky/b+lz/c)-\delta_{hkl}\}\,. \quad (1)$$

James (1948) and Bragg (1929) quote, in addition to (1), the expression

$$\varrho(x, y, z) = \sum_h\sum_k\sum_l A_{hkl}\cos\left(2\pi\frac{hx}{a}-\delta_h\right)\cos\left(2\pi\frac{ky}{b}-\delta_k\right)\cos\left(2\pi\frac{lz}{c}-\delta_l\right), \quad (2)$$

in which axes a, b and c are not in general rectangular. Neither James nor Bragg uses (2) but each develops (1) without apparently realising that, in general, (1) and (2) are not identically equal but only become so for certain