against the field direction, out of the ionic residua, and that the proportion of these residua is different for ions of same sign but diffusing in opposite directions with respect to the field. It is significant that the asymmetry is reversible with the field direction, and is absent under alternating fields[2]. The idea of unequal time-lags for an ion of a given sign in occupying 'holes' available in and against the field direction is distinct from the difference in the 'free-state' average lives of ions of opposite signs implied in earlier theory.

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Yield Stress exerted on a Body immersed in a Bingham Fluid

Boardman and Whitmore[1] have described experiments in which the yield stress in a suspension is measured from the force exerted on a rectangular body which is immersed in the suspension and which has come to rest. They find that the force on the body due to the yield stress depends on the orientation of the body, which it should not, and that this dependence can be expressed by assuming a horizontal-face yield stress about five times the vertical-face yield stress.

From my experience of the flow of suspensions[2,3] I would assume that the boundary over which the yield stress acts is not the surface of the body, but that there is a large quantity of 'solid' suspension above and below the rectangular body acting as part of the body, and that the yield stress is operative over the surface of this much greater area. The reason that this extra 'solid' part of the immersed body exists is probably because the suspension has both a dynamic and a static yield value[2,3]. If the static yield value exceeds the dynamic yield value (with my suspensions of titanium oxide in paraffin it was about 50 per cent greater) and as some of the suspension above and below the rectangular body could be imagined to be brought into action only by shear forces exerted by flowing suspension, then it is clear that a certain amount of the suspension will remain 'solid' in contact with the body.

From the results of Boardman and Whitmore it is apparent that the effective area of the 'solid' suspension above the immersed body is about five times the area in which it is in contact. It can also be assumed that the dynamic yield value is about 29 dynes cm.$^{-2}$, the value found for vertical faces. This can be expected to be less than the value found by assuming a Bingham relationship, owing to the curvature of the shearing-stress/rate of shear curve near the rate of shear axis[3].

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LIKE Dr. Rae we too thought that the shear was probably taking place over an envelope of fluid surrounding the immersed body and we carried out some simple visualization experiments in order to detect the shell[1]. The indications were that although an appreciable decay in the rate of shearing occurred near the body there was no sharp envelope. This may have been because our static yield stresses were always less than the dynamic values, even when allowance had been made for curvature of the shearing stress/rate of shear curve near the rate of shear axis[2].

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METALLURGY

Growth of Aluminium Whiskers by Vapour Condensation

WHISKERS of volatile metals such as zinc[1,2] and cadmium[2,3] have been grown by vapour condensation methods; but whiskers of other metals have mostly been produced by chemical reduction[4,5]. Aluminium presents particular problems because its compounds are resistant to reduction and because the vapour pressure at its melting point is very small (by extrapolation $1\cdot0 \times 10^{-43}$ mm. mercury). At higher temperatures where there is an appreciable vapour pressure the metal is extremely reactive, and even contact with alumina leads to the formation of a sub-oxide. The work reported here shows that it is nevertheless possible to produce aluminium whiskers by a vapour condensation method using high supersaturations.

A growth-chamber of recrystallized alumina, consisting of a 2-c.c. cylindrical crucible inverted on a dish, was contained in a graphite susceptor and supported inside a demountable silica envelope. In the chamber was placed a 0·3-gm. pellet of zone-refined aluminium (resistivity ratio $R_{293°K.}/R_{4\cdot2°K.} > 11{,}000$); the envelope was evacuated and pumped continuously. High-frequency heating was applied to the susceptor from a work-coil outside the envelope, thus maintaining the lower part of the growth chamber at a temperature of about 1,250° C. for 1 hr. At equilibrium there was a vertical temperature gradient of about 600° C./cm. in the chamber. Although whiskers have been grown at argon pres-

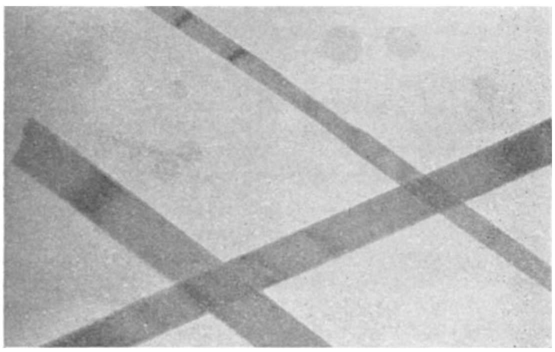

Fig. 1. Straight ribbon-like whiskers. (× 20,000)