volume elements. Such polarization must necessarily be small since the liquids are not ferroelectric[3]. It could be brought about by the combined ordering effects of the walls and the intermolecular forces characteristic of nematic liquids.

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Secondary Electron Emission of Evaporated Titanium Films

The secondary electron emission coefficient δ of evaporated titanium films has been measured at target voltages between 0 and 1,875 V with electron current densities ranging between 2 and 50 μamp/cm^2. The bias voltage applied to the secondary electron collector was between 0 and +12 V. The experiments were done in an ultra-high vacuum system made of stainless steel, sealed with aluminium wire gaskets, and pumped by a fractionating oil diffusion pump. The diffusion pump was fitted with a liquid nitrogen trap and charged with silicone 704 fluid[1].

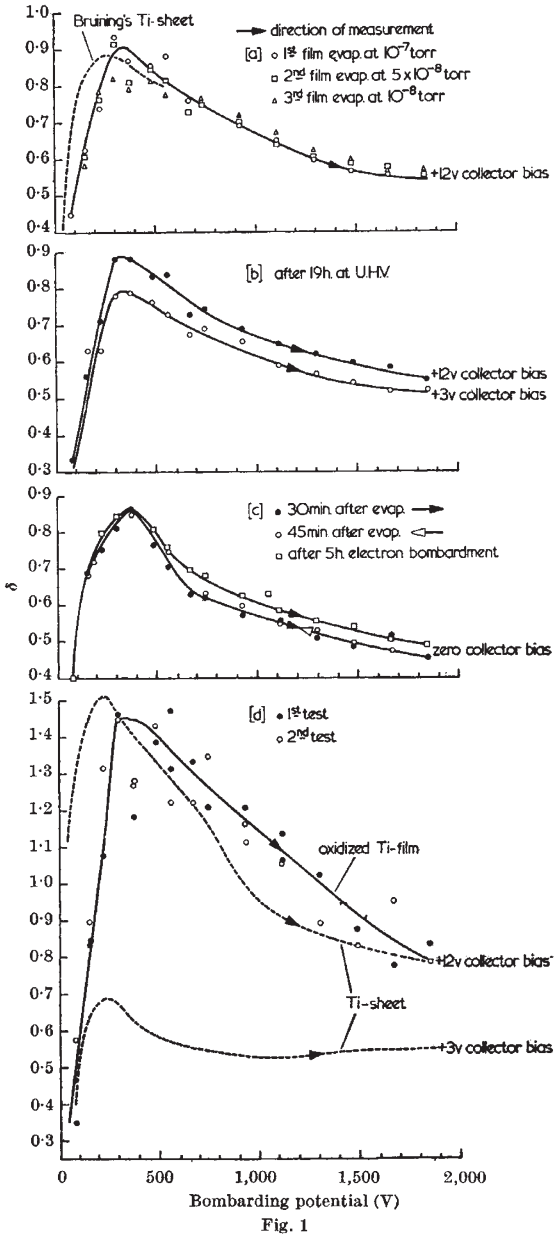

Fig. 1

Tests were made to ensure that the target would remain free of adsorbed oil molecules during the measurement of δ. The target was bombarded with electrons and the rate of growth on its surface of polymerized organic matter measured. Under ultra-high vacuum conditions (ultimate pressure 10^{-9} torr) the growth-rate of the organic deposit was < 5 Å/h (ref. 2); the period for measuring a δ/voltage curve was about 15 min.

Values of δ measured at a pressure of 8×10^{-10} torr are given in Fig. 1*a* for three titanium films deposited in sequence on to a glass substrate; each film was about 200 Å thick. Although the evaporant was thermally degassed during system bake-out the pressure still rose during evaporation, but the pressure rise was less on each successive evaporation. During the third evaporation the pressure rose to only 10^{-8} torr and fell to $< 8 \times 10^{-10}$ torr after the evaporation.

Values have been reported by Bruining[3] of δ for titanium sheet heated in vacuum to dissolve the surface oxide in the bulk metal and his results are shown in the dotted curve in Fig. 1*a*.

The secondary emission of the third titanium film was remeasured after 19 h in ultra-high vacuum (5×10^{-10} torr) and was found to be unchanged (Fig. 1*b*). Likewise continuously bombarding a thick titanium deposit (500 Å) with 30 μamp/cm^2 for 5 h under the same vacuum conditions caused only a small change in the δ/voltage curve (Fig. 1*c*).

A titanium film evaporated in ultra-high vacuum was oxidized by raising the pressure in the vacuum vessel with dry air to 0·1 torr for 24 h and the δ/voltage curve measured (Fig. 1*d*). The δ/voltage curve differed from that of the unoxidized metal and resembled the curve for oxidized titanium sheet as shown in the dotted curves (Fig. 1*d*). The target voltage for δ maximum of titanium sheet is lower than that for the oxidized titanium film. The rough surface of the oxidized titanium sheet prevents the primary electrons from striking the surface at normal incidence and it is known that varying the incident angle lowers the voltage at which δ maximum occurs.

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GEOLOGY

Potassium-Argon Age Determinations on Some Rocks from the Broken Hill Region of New South Wales

Age measurements have been made on a number of rocks from Broken Hill in Australia. The significance of these will be discussed in a forthcoming publication[1]. The following is a brief description of their geological settings together with those age measurements which were made using the isotope dilution technique of potassium–argon age determination.

The Precambrian rocks of the Willyama complex have been subjected to a series of metamorphic and intrusive episodes. A general outline of these events is as follows.