Fig. 3. Sample prepared by means of molecular plating. Polished stainless steel cathode material, solution agitated. (× 750.) No grain visible

made under exactly the same conditions but with an electropolished cathode and with agitation of the solution. In this case no grain structure is visible and we feel confident in claiming uniformity within thin films of the same thickness prepared by means of vacuum deposition[4].

There are definite indications of an inorganic–organic complex molecule formation taking place in the solutions used. However, such complex molecule formation is well known in solvent extraction (liquid/liquid extraction), particularly in the case of uranium compounds[5].

As yet the mechanism of the process is not fully understood; however, the method has also been successfully applied to the quantitative deposition of the rare-earth elements as well as to some of the fission products. In point of fact there seems to be no reason why the described method should not be used for the quantitative deposition of 60 per cent of the periodic system.

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Oscillatory Experiments with a Cone-and-plate Viscometer

IN recent years the cone-and-plate viscometer has been used with some success in the measurement of second-order effects in elastico-viscous liquids. The relevant experiments are usually performed with a very small gap between the cone and plate and at speeds low enough for inertia effects to be ignored. Under these conditions it can be shown, theoretically, that when the motion of the liquid is caused by the relative axial rotation of the cone and plate, the resulting flow is of a simple-shearing type with no secondary flow, the rate of shear throughout the liquid being constant. The cone-and-plate viscometer is, therefore, a convenient instrument for investigating the behaviour of elastico-viscous liquids in a simple shearing flow.

It is becoming increasingly popular to adapt the cone-and-plate viscometer to investigate the behaviour of elastico-viscous liquids in unsteady flows. The cone is either given a small amplitude oscillation about its axis and the effect on the plate recorded, or vice versa. Since viscometers with other geometries (the coaxial-cylinder viscometer, for example) have been adapted in a similar way and have proved very successful in the investigation of the linear time-dependent behaviour of elastico-viscous liquids, it would appear natural to attempt to use the cone-and-plate viscometer for a similar purpose. However, to my knowledge no satisfactory theory for oscillatory flows in the cone-and-plate viscometer has been published; which is not surprising, since there is no solution to the equations of motion (even for a purely viscous Newtonian liquid), which represent a regular transmission of a sinusoidal disturbance from the cone to the plate, or vice versa. It is asserted, therefore, that the cone-and-plate geometry is not a convenient one for the investigation of the linear time-dependent behaviour of elastico-viscous liquids. Instruments with plane, cylindrical or spherical geometry are to be preferred, since consistent theories for oscillatory flows in such instruments are to be found in the literature.

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Optical Measurement of Oil Film Thickness under Elasto-hydrodynamic Lubrication

THE use of Newton rings for the measurement of oil film thickness in point or line contact is rendered difficult by the similarity of the refractive index of normal glass and oil. For this reason it is usually applied when the lubricant is not oil (Skinner[1] used glycerine) or when one of the surfaces is not glass. Recently, Kirk[2] has used interferometry with 'Perspex'; this limits the pressures obtainable, and the peculiar characteristic of elasto-hydrodynamic lubrication, namely, the enormous increase of viscosity with pressure, does not operate. However, by the use of special high refractive index glass (Pilkington, $\mu = 1{\cdot}93$) we have obtained Newton's fringes with a rotating 1-in. steel ball loaded against a glass plate. Fig. 1 shows typical results; the constriction at the end of the contact zone is clearly visible. The load on the ball was 0·815 kg and its surface speed 12 cm/sec with castor oil as lubricant. The diameter of the static Hertzian contact zone was $2{\cdot}24 \times 10^{-2}$ cm, which is shown in Fig. 1 to give the scale. By increasing

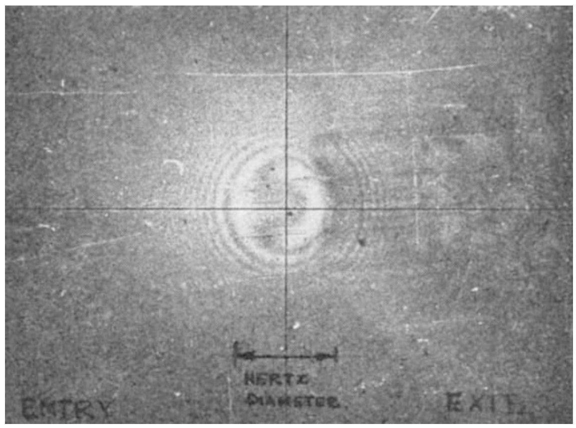

Fig. 1