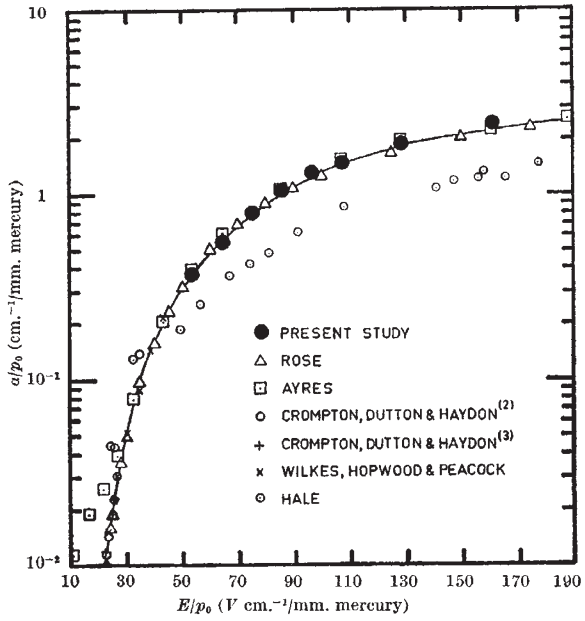

Fig. 1

with the corresponding values of Ayres, but still show poor agreement with the values obtained by Hale.

In view of this disagreement, we feel that some measurements for $E/p_0 > 50$, which have been made in this laboratory as a preliminary to the main investigation of the effect of transverse magnetic fields on the value of α/p_0, should be more widely known. They are shown for comparison with the measurements of Rose and Ayres in Fig. 1, the agreement between these various measurements being within 10 per cent for the whole range of $50 < E/p_0 < 190$. This is important because, whereas Rose[7] took great care to eliminate gaseous impurities from his very pure gas samples, we took no special precautions to achieve high purity. Although the hydrogen was admitted through a palladium thimble, the ionization chamber was not baked out and the lowest pressure obtainable in the vacuum system was about 10^{-3} mm. mercury. In common with all the recent determinations[1-4], however, mercury vapour was not present, pressure measurements being made with an oil manometer and thermocouple gauge. Furthermore, values of α/p_0 measured with and without the use of a refrigerated trap showed no significant difference.

It seems clear, therefore, with our independent confirmation of the values obtained by Rose, under quite different conditions of gas purity, that for values of E/p_0 greater than 50 the effect of small amounts of the common gaseous impurities (for example, oxygen, water, carbon dioxide, nitrogen, mercury) is not so important in hydrogen as was indicated by previous measurements[6].

It would be expected, however, that the effect of an impurity gas of ionization potential (V_I) less than that of hydrogen (V_H) would become more important at lower values of E/p_0 and would lead to an increase in the value of α/p_0. This is because the ratio of the number of electrons with energy greater than V_I to the number of electrons with energy greater than V_H increases with decreasing E/p_0. This interpretation appears to be substantiated by the nature of the large divergence of Ayres's values from those of the recent determinations at low E/p_0. Further, owing to the presence of mercury in Ayres's work and its meticulous exclusion from the later experiments, one would expect the important impurity to be mercury vapour. This conclusion, however, is not entirely justified, as a comparison of similar measurements of α/p_0 in nitrogen, made independently by Ayres[5], Posin[8] and Masch[9], will show. In this case, although all three determinations at low E/p_0 were made with gas contaminated with mercury, the values obtained by Ayres are again considerably larger than those of either Posin or Masch. Unfortunately, there are no recent measurements of α/p_0 available for comparison at these low values of E/p_0 (less than about 30) in pure mercury-free nitrogen, and the precise influence of impurity gases at low values of E/p_0 remains to be determined. Experiments concerned with such problems are at present in progress in these laboratories.

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An Iridium Plating Solution

During an investigation at this laboratory into the depolarization of oxygen electrodes by carbon monoxide, a vibrating iridium microelectrode was required. The basis of the electrode was a steel wire and, for mechanical reasons, some form of iridium plating was necessary. The plating solution detailed below gives a dark grey coherent deposit of iridium when used under the conditions stated. The resultant deposit behaves in a manner characteristic of the metal[1] and is satisfactory for electrochemical work.

The solution consists of ammonium fluoride (1·4 gm.), ammonium borate (0·6 gm.) and iridium chloride (1 gm.) dissolved in water (100 ml.). Ethanol (0·5 ml.) is added and the solution boiled gently until the smell of ethanol is no longer detectable. After filtering, concentrated ammonia (0·1 ml.) is added and the solution made up to its original volume (100 ml.).

Plating is carried out at room temperature at a current density of 20 m.amp.cm.$^{-2}$, the work being made the cathode.

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