For fresh samples the temperature variation of field independent susceptibilities both along the *c*-axis and in the basal plane agree well with the findings of Tasaki and Iida (1963) on synthetic hematite, but there the ferromagnetism, unlike ours, appears only along the plane above Morin temperature (~250°K) and at lower temperatures no ferromagnetism exists at all in either of the directions. In respect of the temperature variations of both the susceptibilities and the ferromagnetism in the plane, the present observations resemble those of Néel *et al* (1952) and Lin (1959), on very pure natural crystals, but differ with their observations of ferromagnetism along the *c*-axis. Lin (1959) observed considerable ferromagnetism along the axis below the Morin temperature (~250°K) which falls sharply to a low value at higher temperatures. Néel *et al.*, (1952) no doubt observed considerable ferromagnetism at lower temperatures (below~250°K) but its temperature variation unlike the observation of Lin (1959) was rather slow. In our case on the contrary the ferromagnetism along the *c*-axis vanishes below ~250°K and appears rather sharply above this temperature.

The measurements on heat treated samples agree closely with those of Mukerjee (1967), the magnitude of magnetisation and susceptibility increasing considerably and the sharp changes at ~250°K vanishing altogether.

The author is thankful to Shri A. K. Dutta for his constant guidance and Professor A. Bose for his kind interest in the work.

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A SIMPLE EXPERIMENTAL DEMONSTRATION OF THE BREAKDOWN OF FARADAY'S LAW OF ELECTROLYSIS

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The author adduced experimental evidence (Palit, 1967) indicating wide deviation from Faraday's law in the electrolysis of weakly conducting solutions, particularly conductivity water. Since this fact runs counter to a long accepted idea, the author presents here a simple experimental device which conclusively demonstrates the failure of Faraday's law.

Experimental—The experimental arrangement is shown in fig.. 1. Of the two conical flasks one contains a 0.5N potassium sulphate solution which is highly

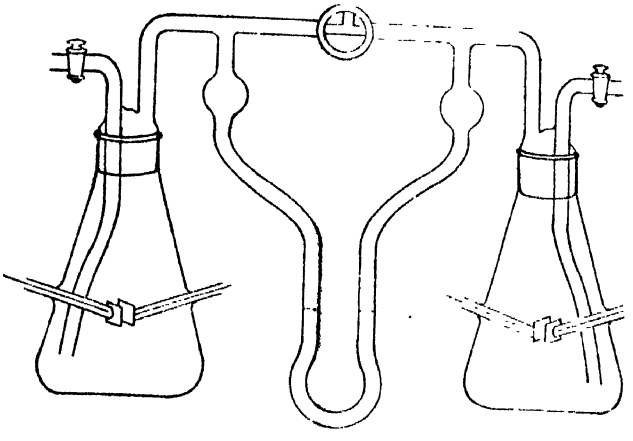

Fig. 1.

recommended as a coulometric solution by Lingane (1945); the other contains conductivity water. Each flask is provided with two platinum electrodes (1 cm × 0.5 cm) and the two flasks are connected in series. With the three-way stopcock open to the atmosphere, a current of about one to two milliamperes is passed by applying the D.C. mains voltage (230 volts). This is continued for a few hours until the two solutions become saturated with electrolytic gas. The stopcock is then closed so that the gases do not escape to the atmosphere but collect on the opposite sides of the manometer. If Farady's law is valid, equal quantities of gas would get collected on both sides. Since the two empty spaces are approximately of equal volume, the manometer would therefore show hardly any difference of pressure with progress of electrolysis. However, if the author's idea that Faraday's law is not valid and predominantly non-electrolytic conduction takes place in the electrolysis of water, is correct, the manometer would indicate increasing pressure in the coulometer (potassium sulphate solution) side with progress of electrolysis.

Experimentally, using a small empty space in each flask it is observed that a difference of level is increasingly produced with progress of electrolysis, the coulometer side building up the higher pressure. This convincingly demonstrates the breakdown of Faraday's law in the electrolysis of water. The demonstration can be repeated again and again by releasing and equalising the pressures on both sides of the manometer by proper turning of the three-way stopcock followed by closing the stopcock. With our set-up the rate of production of level difference is observed to be about thirty mm per hour for 2 milliampere current. This on conversion to volume taking into account the dimension of the apparatus means that barely one-third of the Faradaic value of the electrolytic gas is liberated

on electrolysis of pure water. The fact that an appreciable difference in level can be demonstrated in less than half an hour makes this simple experiment a great success as a lecture demonstration. In addition to the above differential measurement which very convincingly demonstrates the failure of Faraday's law this apparatus is also very suitable by connecting one side of the manometer to the atmosphere for measuring the rate of gas evolution singly in any one of the cells.

Our above observations confirm our previous finding that Faraday's law falls short considerably in the electrolysis of water. Such wide discrepancy is difficult to be explained by assuming side reactions, for example, by assuming H_2O_2 formation at anode and reduction of the same at cathode, as suggested by Page and Lingane (1957) to be responsible for small observed deficit in hydrogen oxygen gas coulometer. It appears that with decrease of ionic concentration and current strength, and increase of voltage, the current tends to be carried by a mechanism different from that envisaged by Faraday's law. As to the mechanism of this non-electrolytic conduction, it is recalled that in some crystals as also in solutions of sodium in liquid ammonia partly ionic and partly electronic conduction simultaneously takes place. In water medium the electronic conduction is more likely to be through the intermediacy of charged water molecules, $H_2O^-_{aq}$ and $H_2O^+_{aq}$, particularly as hydrated electron has been shown to exist during electrolysis of sodium sulphate solution by Walker (1966, 1967). However, we prefer to keep the question of detailed mechanism open until more definite evidence is forthcoming. Detailed results with this apparatus will be published later.

Thanks are due to Sri Prithwish Kumar Basu for experimental assistance.

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A NOTE ON LONGITUDINAL DISTURBANCES IN A SEMI-INFINITE PIEZOELECTRIC ROD IN A MAGNETIC FIELD

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(*Received December* 6, 1967)

The piezoelectric problems constitute an important branch of study in view of their applications in ultrasonics and acoustics and these problems have been