one, two or more electronic charges at distances along the plates inversely proportional to their electrical mobility (Fig. 2). Reduction of the applied voltage enables one or more streams containing these particles to pass out of the exit of the box instead of being deposited on the plates. Using a 'Millipore' filter, this effect enables one to distinguish between streams of particles separated according to their charge (Fig. 3). In the absence of the filter one or more of these streams can be extracted by drawing air through suitably placed nozzles at the same velocity as in the box itself. This can achieve complete separation of an aerosol carrying a specified number of charges (of either sign) per particle. The aerosol must be used as soon as it is produced, because the production of small ions by background radiation may cause it to revert to a state of charge equilibrium. The arrangement has been used to determine the diffusion coefficient of singly charged particles and to study the approach to charge equilibrium of an aerosol the particles of which carry a specified number of unipolar charges. We consider that the method may have wide application in the study of electrical effects in deposition, filtration and inhalation of sub-micron particles in a more quantitative manner than previously possible.

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Pulses in Iodide Concentration during the Periodic Decomposition of Hydrogen Peroxide

WE have discovered marked pulses in the concentration of iodide ions, $[I^-]$, during the periodic decomposition of hydrogen peroxide in the acidic reaction system comprising iodine, iodate and intermediate compounds[1-3]. In one experiment, two sections of which are shown in Fig. 1, seventy-two pulses were recorded in the potential of an electrode selective for iodide ion (Model 94–53, Orion Research Inc., Cambridge, Mass.). Pulses in the rate of oxygen evolution, (dO_2/dt), were simultaneously recorded as the electrical output of a mass flowmeter (model LF–20; Matheson and Co., East Rutherford, N.J.).

The pulses have several distinguishing features.

First, they are regular and, when $[I^-]$ and (dO_2/dt) pulses both occur, they are invariably synchronous. Second, they have a characteristic shape, the slow decrease in $[I^-]$ between pulses gradually accelerating until the $[I^-]$ trace in Fig. 1 becomes almost vertical, whereupon $[I^-]$ rapidly reaches a minimum. This is then followed by a linear increase in $[I^-]$ which later accelerates until a value of $[I^-]$, slightly below the initial value, is reached. Mathematical analysis of these pulse shapes should help to determine the mechanism. Third, increasing values of (dO_2/dt) accompany lowered $[I^-]$ and vice versa, and a maximum in (dO_2/dt) follows a minimum in $[I^-]$. Fourth, as H_2O_2 is consumed, the frequency of both pulses decreases systematically: that is, the interval between pulses is lengthened. Because (dO_2/dt) is almost certainly proportional to $[H_2O_2]$, the amplitude of these pulses shows an expected decrease, but the width and amplitude of the $[I^-]$ pulses stay almost constant throughout the reaction—even near the end, when (dO_2/dt) pulses can no longer be detected.

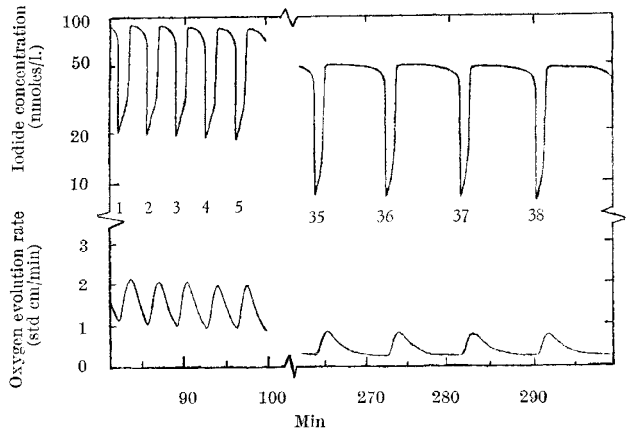

Fig. 1. Simultaneous measurement of the rate of oxygen evolution (lower trace) and concentration of iodide (upper trace) early (pulses 1–5) and later (pulses 35–38) in the reaction at 50° C. Initial composition of the reaction mixture: 0·5 M hydrogen peroxide, 0·1 M potassium iodate, 0·056 M perchloric acid. Total volume: 100 ml.

Results like those in Fig. 1 have been found in each of several experiments at the concentrations cited. They represent an advance over earlier work in this reaction system, not only in the discovery of the iodide pulses but also in the simultaneous recording of pulses of two kinds. The electrically recorded (dO_2/dt) pulses duplicate in all essential respects (dO_2/dt) pulses previously obtained from gas burettes. Consequently, the synchronous character of the (dO_2/dt) and $[I^-]$ pulses which we have recorded seems proof that they are characteristic of the reaction being studied. The periodic reaction under study is thus at least a triply pulsed (in (dO_2/dt), $[I_2]$, and $[I^-]$) reaction. These three kinds of pulses, all measurable, are doubtless accompanied by pulses, so far unobserved, in the concentrations of reactive intermediates. An understanding of the shapes and phase relationships of the three kinds of measurable pulses may prove to be the key to the mechanism of this highly unusual reaction.

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BIOLOGICAL SCIENCES

Light Induced Changes in the Conductivity of Thin Lipid Membranes in the Presence of Iodine and Iodide Ion

SINCE the announcement by Mueller *et al.*[1] of a technique for forming thin (< 100 Å) lipid membranes separating two aqueous phases, there has been a growing interest in the permeability of these films to ions, neutral solutes and water. In the absence of any modifying agents, the membranes have resistances of approximately 10^8 Ω cm² in 0·1 M salt solutions[1]. In the presence of both iodine and iodide ions, the membrane resistance falls to values of 10^4 Ω cm² or lower[2,3]. In this state the membrane behaves as an ideal iodide ion electrode. The current carriers in the membrane appear to be polyiodides (for example, I_5^-),