two carbon atoms close together, and thus diminish the valence angle.

The large discrepancy between the angles in the two compounds is supported by independent evidence. The permanent dipole movements of dimethyl oxide and ethylene oxide are $1{\cdot}29 \times 10^{-18}$ and $1{\cdot}88 \times 10^{-18}$ e.s.u., respectively, the latter value being thus much larger. Indeed the two moments bear a ratio $\frac{1{\cdot}29}{1{\cdot}88} = 0{\cdot}69$, which is practically the same as the value $\frac{\cos 51^\circ}{\cos 32^\circ} = 0{\cdot}74$, which we should expect from their relative valence angles.

In connection with the above calculation of the valence angles from the Raman frequencies, we should add that in both the compounds the binding forces between the atoms come out of the proper magnitude.

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A Note on the Disintegration of α-Particle.

IN a recent paper announced in *Current Science*, 1933, and since published in *Phil. Mag.*, **14**, p. 1097, 1933, we have derived the wave-statistical formula connecting the disintegration constant and the velocity of emission of α-particle, *viz.*,

$$\lambda = \text{Const.}\ \frac{\sqrt{\text{E}}}{\gamma_0^2\, h \cot u_0} \cdot e^{-2k(2u_0 - \sin 2u_0)} \quad ..(1)$$

where E = the energy of the α-particle, γ_0 = the critical radius of emission, $k = \frac{4\pi z^* e^2}{h\sqrt{2\text{E}/m}}$ and $u_0 = \frac{a\gamma_0}{4k}$ in which $a = \frac{4\pi\sqrt{2m\text{E}}}{h}$. This formula has been shown to closely agree with the experiment. From our theory we also obtain an interesting formula for the critical radius of emission, *viz.*,

$$\gamma_0 = \frac{9}{64\pi} \cdot \frac{hv}{az^*e^2} = \frac{9}{64\pi} \cdot \frac{h^2}{4\pi m z^* e^2} \quad ..(2)$$

being independent of the velocity of emission as it should be. It is, however, inversely proportional to the effective atomic number z^*. This appears quite natural when it is remembered that the packing of the nucleus increases with z^* and so the emission is likely to take place even from a smaller γ_0. For radium emanation Equation (2) gives $\gamma_0 = 1{\cdot}2 \times 10^{-15}$ cm.

On the other hand, with decreasing z^*, γ_0 increases and so the density of matter within the nucleus decreases. Ultimately a limit is reached when the damping coefficient or, in the language of wave-statistics, the viscosity of the corresponding phase space becomes vanishingly small and there is no longer spontaneous disintegration. Let us take the case of hydrogen, for which Equation (2) gives $\gamma_0 \sim 10^{-13}$ cm. There being no spontaneous disintegration in this case, the critical γ_0 should correspond to the size of the hydrogen nucleus consisting of a single proton. It is significant that γ_0 thus obtained is exactly of the right order for a free proton.

We shall conclude with a few remarks on the parallel wave-mechanical theories given by Gamow, Sexl and others. It may be noted that they do not obtain any expression for the critical radius of emission corresponding to the wave-statistical Equation (2). However, their equation for the disintegration constant is more or less similar to our equation (1). The important difference arises on account of their dropping the unknown constant which should involve the unknown normalising factor and some other unknown constant. They define $\lambda = \frac{\text{G}}{\tau}$, where G is the transmissibility and $\tau = \frac{2\gamma_0}{v}$, v being the velocity. It, however, appears to us that within the hard core τ can only be proportional to $\frac{2\gamma_0}{v}$ and not equal to it. This explains the latter constant. That the normalising factor has been dropped is evident from Sexl's rigorous treatment of the problem in *Zeit. f. Phys.*, **56**, p. 62, 1929 and **81**, p. 163, 1933.

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The Effect of Magnetic Field on Streams of Charged Particles.

ABOUT three months ago I announced the results of some of my observations on the effect of magnetic field on charged particles in motion. A short press report of this work was published later on in several newspapers in different parts of India on or about the 22nd January 1934. The following is a summary of some of those results obtained by me :—

(1) I observed that streams of fine gas bubbles evolved during electrolysis, which rose vertically upwards, were deflected by a magnetic field in a direction at right angles to the field. The direction of this deflection was reversed by reversing the magnetic field, and the extent of the deflection was found to depend upon the strength of the field. The deviation was different in the case of different gases evolved during the electrolysis of several solutions. Thus, during the electrolysis of sulphuric acid the bubbles of hydrogen gas were deflected in one direction and those of oxygen in the opposite direction, thus indicating that they were oppositely charged.

(2) Streams of hydrogen gas bubbles evolved during the decomposition of acids by metals like zinc, which is a purely chemical reaction, were not appreciably deflected by the magnetic field; but when a pure zinc piece with a copper wire wound round it was immersed in sulphuric acid, there was an immediate evolution of hydrogen gas bubbles, which were certainly deflected by the magnetic field. Thus in the cases examined by me so far the gas bubbles evolved during purely chemical reactions were not charged, whereas those liberated during an electrochemical reaction were electrically charged. I am at present making a systematic study of the effect of the magnetic field on the gas bubbles evolved in reactions of different types, and I expect that the results will throw light on the nature of these reactions.

(3) Further, I have found that streams of charged colloidal particles moving under the influence of an electric field were also deflected by a magnetic field, the direction of deviation depending upon the charge of the particles.

The fact that charged particles like the electrons, α-particles, etc., are deflected has been well established by the classical researches of Sir J. J. Thomson and others, and the idea underlying the above-mentioned observations of mine is therefore not altogether new. Nevertheless, the interest in my observations perhaps lies in the extension of the idea to the case of the charged colloidal particles, gas bubbles, etc., and particularly in the application of the phenomena observed by me to a number of important problems in modern physical chemistry. A short account of some of these applications is given below.

One of the applications is in the determination of the mass of the individual charged particles in colloidal solutions, suspensions, etc., by measuring the deflection of these charged particles as observed in an ultramicroscope under the simultaneous action of electric and magnetic fields. From a knowledge of the extent of deflection, the intensity of the applied fields and the charge of the particle, which is determined separately, the mass can be easily calculated. I am at present busy developing this technique. An account of the results will be published in the near future.

Another application is to the separation of diplogen (heavy hydrogen) from ordinary hydrogen—a problem which is receiving much attention at present. The method which I have adopted is as follows:—In the electrolysis of water containing an acid or an alkali the electrode at which hydrogen was evolved was made of a fine platinum wire, fused into one end of a narrow glass tubing so as to expose only a very small portion of it to the solution, and conditions were so adjusted as to give gas bubbles of practically uniform size. When the electric current was passed, a fine stream of bubbles was found to ascend upwards, but when the magnetic field was also applied the stream spread out into different streams. I believe that I have thus been able to separate diplogen from ordinary hydrogen. I am at present repeating these experiments under the most suitable conditions so as to confirm these results. The importance of such a method is obvious since, apart from the theoretical interest, it furnishes us with an easy method of obtaining diplogen in a pure state and in a short time.

A detailed account of these experiments will be shortly published. I have already communicated a note on these observations to Professor F. G. Donnan, C.B.E., F.R.S., (London) and to Professor The Svedberg (Upsala) two months ago. Owing to several interruptions in my work I have not been able to complete it earlier.

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Vasicin and Peganin.

IN a recent paper (*Ber.*, **67**, 45, 1934) Späth and Nikawitz have advanced the constitution I for an alkaloid, peganin,