

in tumour cells. Prussic acid and low temperature greatly increased the susceptibility of tumour tissue to radium, anaerobiosis produced the opposite effect. The glycolytic inhibitors iodoacetic acid and sodium fluoride had little or no effect on the action of radium. As a result of their experiments they suggest that it may be possible to increase the radiosensitivity of cells by introducing suitable chemical substances. The results obtained in our laboratory appear to lend force to this suggestion by showing that reactions fostered by gamma-, and X-, radiations can be sensitised by small additions of chemical bodies in an analogous manner to the action of sensitisers in many well-known photo-chemical reactions.

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Dec. 7.

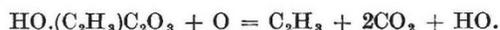
¹ *Proc. Roy. Soc., B*, 113, 226, 238.

Ethane from Acetic Acid

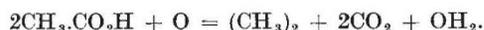
I SUGGEST that Messrs. Glasstone and Hickling (*NATURE*, Feb. 3, p. 177) may spare themselves from any "comprehensive investigation of the Kolbe synthesis". This was made clear nigh on fifty years ago.

Chemists were rational in the distant past. Having proved experimentally, by their joint labours, in 1847-48, the truth of the conception first propounded by Berzelius, that acetic acid was "a compound of oxalic acid with the conjunct methyl", our view to-day, Frankland and Kolbe both started out as Japheths in search of Radicles. Frankland went gaily off with the alcoholic iodides and metals, to bag zinc methyl and various paraffins. Kolbe resorted to electrolysis but also bagged paraffins. His results are recorded in the *Quarterly Journal of the Chemical Society*, vol. 2; the account was given to the Society on March 29, 1849, before anything had been heard of Kekulé.

From previous experience, regarding "electrolysed oxygen (as) one of the most valuable oxidising agents at the chemist's disposal"; thinking that "electricity might effect a separation of its conjugated constituents": Kolbe electrolysed acetic acid (as potassic salt). He obtained the result he expected, expressed in the equation:



Kolbe's use of CO_2 ($\text{C} = 6$, $\text{O} = 8$) is of historical significance. Acids were then thought of as compounds of an acidic with a basic oxide; bearing this in mind, the equation we write to-day is the precise equivalent of Kolbe's:



Came 1865. Schützenberger, following up Sir Benjamin Brodie's discovery of acetic peroxide, simply mixed an excess of barium peroxide with acetic oxide in a small flask; on warming the mixture, ethane, together with twice its volume of carbon dioxide, was regularly evolved. He remarks: "the preparation of ethane in this way is as simple as that of any other gas". The work has been strangely overlooked (*C.R.*, 61, 487; 1865).

Some of us, having regard for patent facts, have long preached the doctrine, that the electrolysis of

aqueous solutions is essentially an oxidation (hydroxylation) process. Oxygen is commonly obtained because the peroxide first formed is decomposed at the electrode surface. Any promoter of its breakdown, such as lead peroxide, necessarily prevents the appearance of the peroxide or of its immediate decomposition products. In making acetic acid from aldehyde, on the large scale, during the War, the need of a manganese or other suitable salt to promote decomposition of peracetic compounds was clearly recognised, though not fully until after a serious explosion. Textbooks have little regard for truth. The fiction that hydrogen and oxygen are immediate products of electrolysis is a hardy chestnut we might well transfer to the dustbin: no boy should be taught to use it as a Conqueror.

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Passage of Hydrogen through Steel

I WAS much interested in the communication by T. N. Morris to *NATURE* of February 10, p. 217, concerning the observations he has made relating to the diffusion of hydrogen through steel. Since he asks whether facts of the kind he mentions have been previously recorded, may I make the following observations?

The diffusion of hydrogen through mild steel under varying conditions of temperature and acid concentration formed the subject of a paper which was published (under my name) in the *Journal of the Iron and Steel Institute*, vol. 2, 1925. This paper dealt with a quantitative study of certain aspects of this interesting problem; but it was by no means the first time that the phenomenon had been observed. So far back as 1874, Osborne Reynolds directed attention to it in a paper he published in the *Memoirs and Proceedings of the Manchester Literary and Philosophical Society*, vol. 13, p. 93.

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Side-Chain Reactions of Benzene Derivatives

WE have recently examined a number of side-chain reactions in the light of the postulate that the differences in the rates of reaction of a series of similarly constituted compounds under identical conditions are to be ascribed solely to different energies of activation, substituents contributing additively to the total energy¹. Our results² for the reaction of hydrogen ion with various *p*-substituted acetophenones $\text{X} \cdot \text{C}_6\text{H}_4 \cdot \text{CO} \cdot \text{CH}_3$ (acid-catalysed prototropy) indicate that the energies of activation are given by the expression $E = E_0 - C(\mu - a\mu^2)$, where C and a are constants for the series, E_0 is the value of E for the unsubstituted compound, and μ is the dipole moment of $\text{C}_6\text{H}_4\text{X}$. The substituents dealt with included three halogens, to which the equation applies accurately, but did not include 'inclined' groups such as $-\text{OAlk}$ and $-\text{NAlk}_2$. We further suggested³ that the expression $E = E_0 \pm C(\mu - a\mu^2)$ might be applicable to side-chain reactions in general, the negative and positive signs referring respectively to those of Classes A and B¹. A review of fourteen reactions led us to the conclusion that, for *m*-substituted compounds, the equation is valid except