

amalgam dropping into an air-free 0.1 *N* potassium chloride solution which was 0.04 *M* with respect to cadmium sulfate. The potential of the dropping electrode, referred to the saturated calomel electrode, $E_{d.e.}$, is plotted on the abscissa, and the corresponding current in microamperes on the ordinate. The horizontal line marks the rest point (zero current) of the recording galvanometer. The section of the curve above the galvanometer zero line (positive current) corresponds to the discharge of cadmium ions into the amalgam, $Cd^{++} + 2e + Hg \rightarrow Cd(Hg)$. The section of the curve below the galvanometer zero line (negative current) is due to the anodic dissolution of cadmium from the amalgam, $Cd(Hg) \rightarrow Cd^{++} + 2e + Hg$. The anodic section of the curve exhibits a prominent maximum, exactly similar to the maxima frequently obtained in the reduction of metal ions at the dropping mercury electrode, which is followed by a well-defined diffusion current whose magnitude is proportional to the amalgam concentration.

The curve in Fig. 2 was obtained in a similar way, except that 0.1 ml. of a 0.1% solution of sodium methyl red was added to 10 ml. of the solution. The addition of the methyl red completely eliminated the anodic maximum, and produced a very well-defined wave with a constant diffusion current. This effect of methyl red shows that the anodic maximum, like the common cathodic maxima,² is caused by phenomena on the solution side, and not the amalgam side, of the amalgam-solution interface.

The characteristics of these anodic c. v. curves with dropping amalgam electrodes are being further investigated, and a more detailed report will be submitted in the near future.

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JAMES J. LINGANE

RECEIVED MARCH 10, 1939

KINETICS OF HYDROCARBON DECOMPOSITION

Sir:

I have to thank you for your courteous permission to call attention to the fact that, in his recent review of the Kinetics of Hydrocarbon Decomposition [*Chem. Rev.*, **22**, 311 (1938)] Professor Steacie has completely mis-stated our results and conclusions. We show that when one experiments with equilibrium mixtures of ethane, ethy-

lene, and hydrogen, instead of with the pure hydrocarbons, the effect of the changes represented by the equation



is eliminated. Professor Steacie's statement is exactly the opposite to this. Following the pyrolytic changes by means of exact analyses, which are not "unchecked," it is then found that the rates of disappearance of 2-carbon hydrocarbon is represented by the equation

$$-d(\text{2-carbon hydrocarbon})/dt = K(C_2H_6)(C_2H_4)$$

This conclusion results from nearly a hundred experiments with equilibrium mixtures, and can hardly be a matter of chance. The conclusion is that the time-determining step is a process involving one molecule of each of the hydrocarbons.

Our experiments do, indeed, differ from those of others, but because we alone work with equilibrium mixtures, and also take account of the fact that the formation of benzenoid condensation products is of importance equal to that of the formation of methane. This latter point has been generally ignored. In these experiments, contrary to Professor Steacie's statement, we observe no induction period, and the x/t graphs show no breaks. Initial temperature lag is of no importance, or is easily corrected for.

With pure ethane the rates of formation of methane and condensation products are self-accelerated, a fact which supports the conclusion which we draw from our experiments on the equilibrium mixtures. The rates of formation of these products are, however, somewhat faster than the rates calculated from the experiments with equilibrium mixtures, and the graphs show breaks, but not till a long time after the start, so that they cannot be accounted for by initial time lag. We cannot explain these phenomena, a fact which is hardly remarkable, considering the present position of our knowledge of chemical kinetics.

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MORRIS W. TRAVERS

RECEIVED FEBRUARY 6, 1939

NATURE AND PARTIAL SYNTHESIS OF THE CHICK ANTIDERMATITIS FACTOR

Sir:

The preparation of highly active concentrates of the chick antidermatitis factor has been de-

scribed [Woolley, *et al.*, *J. Biol. Chem.*, **125**, 715 (1938)]. Further investigation revealed that the activity of these concentrates is very readily destroyed by alkali. β -Alanine has been isolated from the alkali-inactivated concentrates. The acidic part of the alkali-inactivated concentrates can be reactivated by coupling with synthetic β -alanine in the following manner.

The alcohol-soluble barium salt fraction (Woolley, *et al.*) was dissolved in *N* sodium hydroxide and warmed for one hour. The solution was acidified and shaken with ethyl acetate, and the extracted material was acetylated with acetic anhydride. Volatile matter was removed under reduced pressure, and the residue was treated for one hour at room temperature with a large excess of SOCl_2 . After removal of the excess reagent under reduced pressure, the light brown, semi-solid residue was dissolved in dry pyridine, cooled in ice water, and slowly treated with an excess of β -alanine ethyl ester. The pyridine was removed under reduced pressure, and the residue was suspended in dilute hydrochloric acid (final pH of 2) and extracted with ethyl acetate. The extract was freed of solvent, and treated with cold, alcoholic sodium hydroxide in order to remove the acetyl and ester groups. After one hour the solution was carefully neutralized with alcoholic hydrochloric acid.

The β -alanine was isolated from the ethyl acetate extracted residue of the alkali-treated concentrate by continuous ether extraction for four days, extraction of the residual solution with butanol, and crystallization from the extract with

ethanol: yield, 9 mg. from 1300 g. of liver extract; m. p. 204–206°; found N, 15.8.

The assays of the untreated concentrate, the alkali-treated concentrate, and the above products are shown in Table I.

TABLE I

	Level fed, equiv. to liver extract	Av. gain in 4 wks. ^a	% of chicks showing symptoms
Untreated concentrate	10%	91, 106	0
NaOH treated	40%	34, ...	100
Synthesized mixture	40%	94, 95	0
β -Alanine	0.1% of ration	37, ...	100

^a Figures represent two independent runs.

The chick antidermatitis factor appears to be very similar in properties to pantothenic acid [Williams, *et al.*, *THIS JOURNAL* **60**, 2719 (1938); Snell, *et al.*, *ibid.*, **60**, 2825 (1938), and private communications]. Thus they both are heat and alkali labile hydroxy acids. The acetyl derivatives of both are heat stable and distill at approximately the same temperature and pressure. Furthermore, the solubilities of the free acid and of its metallic salts in various solvents are similar. Williams has shown that his preparations are composed of an hydroxy acid and β -alanine. The above experiments indicate that the chick antidermatitis factor is a hydroxy acid in amide linkage with β -alanine. Final proof of the identity of the two factors must await crystallization of the pure compound.

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RECEIVED MARCH 3, 1939

NEW BOOKS

Atomphysik. I. Allgemeine Grundlagen. II. Theorie des Atombaus. (Atomic Physics. I. General Principles. II. Theories of Atomic Structure.) By Dr. KARL BECHERT and Dr. CHRISTIAN GERTHSEN, Professors in the University of Giessen. Walter de Gruyter and Company, Woyrschstrasse 13, Berlin W 35, Germany, 1938. 11 × 16 cm. 149 + 176 pp. 52 + 23 figs. Price, RM. 1.62 each.

These volumes, part of the series of books on chemical and physical subjects published by Göschen, attempt in three hundred small pages to cover the general field of atomic physics from an experimental and theoretical

standpoint. Such an undertaking is an ambitious one; it is not surprising that complete success does not result.

Volume I deals mainly with the experimental and theoretical background of modern physics: kinetic theory, electronic theory, beta-particles and cathode rays, the periodic system, radioactivity, collisions of the second kind, and the duality of matter. Volume II is principally an introduction to the quantum mechanical treatment of the atom beginning with the uncertainty relation and ending with a short excursion into the application of quantum mechanics to molecular spectra.

The presentation in general is clear, but the require-