also equally effective (compare J. Am. Chem. Soc. 47, 2678 (1925)). Argon when mixed with electrolytic gas also was found to have a positive catalytic effect, though less than that of nitrogen.

The generality of the effect having been thus extended, the question arose as to why CO_2 when generated in other reactions had failed to show a similar catalytic effect. Is the exception peculiar (1) to CO_2, or (2) to the systems in which it has been generated, or (3) to both? To settle (1), CO_2 has been used in acetylene polymerization and in water synthesis with the following results: $\frac{-M_{C_2H_2}}{N_{(C_2H_2 + CO_2)}} = 17.4$, at a point in the reaction where 55 per cent. of the positive ions are CO_2^+. While it thus appears that CO_2 acts quite normally as an inert ion catalyst, about 10 per cent. of CO_2 was found to be lacking in the gas phase at the end of the reaction when C_2H_2 was completely exhausted from an initial (1:1) mixture. Whether this amount of CO_2 had reacted chemically has not been determined. In the system $1(2H_2 + O_2) + 1CO_2$, carbon dioxide did not prove to be inert. The entire rate of reaction was accounted for as the sum of the known rates of the separate reactions: $2H_2 + O_2$ and $2H_2 + CO_2$. (*loc. cit.*)

To settle (2), argon has been used as inert catalyst in the reaction $2CO + O_2 = 2CO_2$, where CO_2, although produced by the reaction, fails to accelerate it. Argon was found to catalyze the reaction, but less than the normal, just as it was found to do in the oxidation of hydrogen.

In discussing these results, Professor K. T. Compton proposed a very interesting hypothesis, namely, that when the inert gas has a higher ionization potential than the reacting gas has, the positive ion of the inert upon colliding with the neutral reactant molecule will ionize the latter by taking away an electron from it; for example, with neon and acetylene, $Ne^+ + C_2H_2 = Ne + C_2H_2^+$. The $C_2H_2^+$ then behaves just as if it had been originally formed by an alpha-particle collision. This would explain at once why the inert ions have the same power of producing polymerization as have the primary ions of the reactant. The catalytic reactions so far considered conform generally with this principle—but it will be possible to give it a severer test by choosing inerts with ionization potentials definitely lower than those of the reactants. Then there should not only be no positive catalysis, but a high degree of negative catalysis by the reverse process.

The question resolves itself into a fundamental one of the properties of gaseous ions. When the positive ion of the inert gas meets a neutral molecule, do they exchange the positive charge, or do they unite and form a clustering center? Or, putting the question another way: Does the ion of the inert revert to the neutral state upon first effective collision with the reactant, or not until after clustering is complete and electrical neutrality is reestablished by the return of an electron? Professor Compton has volunteered to approach the question from the physical side and we have planned a series of experiments which ought to afford a decision through the chemical evidence to be obtained. A more extended discussion will be postponed, awaiting the new results.

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CONCENTRATION OF THE GROWTH-PROMOTING PRINCIPLE OBTAINED FROM YEAST. (VITAMIN B.)

It was reported in our previous communication[1] that the growth-promoting principle present in the brewers' yeast could be prepared in a form which was in a unit weight approximately 2,000 times stronger than the dried yeast itself. The substance was still a complex mixture. Further purification was made difficult by the fact that the process was accompanied by large losses of active material. It was urgent therefore to seek for a more economical method of concentration. Such has now been developed.

In only three steps a material is obtained which is equal in potency to the material previously described and which is associated with a loss of only 50 per cent. of the original material. The starting material is the fraction of yeast extract prepared according to Osborne and Wakeman. The aqueous solution of this material is brought to $pH = 4$. Some inert material settles out. From the solution the active material is precipitated with alcohol. The solution of this material is treated with nitrous acid and by this treatment a substance is obtained which is active in daily doses of 0.0018 gm. The maximum loss in active units is 10 per cent. Often such material is prepared without any loss in active units. The composition of this material is $C = 38.2$, $H = 6.0$, $N = 10.3$, $P = 7.6$, $S = 1.46$, $NH_2.N = 0$. The sulfur was present mostly in the form of $-SH$ groups. From this material the active principle was extracted with silica gel. From the gel by extraction at pH 9.5 a material was obtained which was active in daily doses of 0.00008 gm. The material contained about 4 per cent. of sulfur. The white rat was used as the experimental animal.

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[1] Levene, P. A., and van der Hoeven, B. J. C., *J. Biol. Chem.*, xlv, 483 (1925).