

glass wool, removed copper from solution, Elissaffoff concluded that the copper was adsorbed at the interface and that the increased concentration of copper was responsible for the increase of rate. This conclusion was justified by close parallelism between the increased rate of reaction when the copper concentration was increased tenfold, and the increased amount of copper removed from a solution of similarly increased copper concentration.

At the time my attention was called to this article, I conducted a few brief tests with results incompatible with those of Elissaffoff. The experiments could not be amplified for lack of time, and therefore it seems best to indicate them briefly now. Hydrogen peroxide solutions were decomposed in quartz vessels by freshly prepared copper sulfate solutions containing one millimole per liter of copper sulfate. It was found that the velocity constant was nearly first order and not easily reproduced in the presumably neutral solutions employed. It is felt that the data from one series of experiments may be compared among themselves, however. It was also found that the addition of glass wool to a solution containing hydrogen peroxide and copper sulfate did increase the rate of decomposition but to a less extent than Elissaffoff observed. The reaction velocities for the promoted reaction increased appreciably with time, which points to a dependence of rate upon an adsorbed catalyst. However, it was found that a filtered extract of the glass wool increased the rate quite as much as the solid material. Also it was found that increasing the amount of glass wool ten-fold increased the rate of reaction very little. From these observations it was concluded that the glass wool no doubt removed copper from solution as Elissaffoff says, but not as copper sulfate. The copper probably formed a basic salt upon the surface of the glass wool, and then solid copper peroxide, a reaction which is favored by the alkali from the glass. The reaction in the absence of glass wool can be and probably is homogeneous; thus it seems probable that the mechanism of the reaction is different under "promotion" conditions than otherwise, and that this reaction is not an example of the effect of adsorption upon catalytic reaction rates.

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THE OXIDATION OF CARBON MONOXIDE BY DISSOCIATED WATER VAPOR

Sir:

In a recent publication Harteck and Kopsch¹ have shown that atomic oxygen, from a discharge tube, has very little effect on carbon monoxide;

¹ Harteck and Kopsch, *Z. Elektrochem.*, **36**, 714 (1930).

only 5% reacted. At the suggestion of Professor Hugh S. Taylor we have carried out experiments on the action of dissociated water vapor on carbon monoxide. It seems entirely probable that in the water vapor discharge tube² we have a source of hydroxyl, also the reaction³ $\text{OH} + \text{CO} = \text{CO}_2 + \text{H}$ is 24,000 cal. exothermic. That we do get oxidation is shown by the results given in Table I.

TABLE I
RESULTS OF EXPERIMENTS

Water through tube, mole	CO, mole	CO converted to CO ₂ , %
0.039	0.005	21.60
.059	.005	26.30

We have also passed a constant quantity of oxygen through the tube and then varied the water vapor concentration. It is to be pointed out that the exit of the tube did not become very warm, which means that the water vapor was not decreased to such an extent that recombination of the atomic oxygen took place on the walls. Also, there was no back diffusion to the discharge tube in any of the experiments. The results are given in Table II.

TABLE II

EXPERIMENTAL DATA			
Water through tube, mole	Oxygen, mole	CO, mole	CO converted to CO ₂ , %
0.003	0.028	0.005	5.90
.012	.028	.005	24.30
.059	.028	.005	37.10

Since Copeland⁴ has found that water vapor is essential for the production of atomic oxygen, we can attribute the oxidation in Harteck and Kopsch's experiment to the presence of a small quantity of water.

Further details will be published shortly.

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² Lavin and Stewart, *Proc. Nat. Acad. Sci.*, **15**, 829 (1929); Taylor and Lavin, *THIS JOURNAL*, **52**, 1910 (1930).

³ Bonhoeffer and Haber, *Z. physik. Chem.*, **A137**, 263 (1928).

⁴ Copeland, *Phys. Rev.*, **36**, 1221 (1930).