

sulfuric acid, perchloric acid, and mercuric chloride unite with it, forming deep violet halochromic compounds, which on pouring into ice water yield the carbinol,  $(C_6H_5C_6H_4)(C_{10}H_7)(C_6H_5)C-OH$ , in its optically inactive form. A solution of titanium tetrachloride in chloroform when added to a chloroform solution of A produces a deep violet halochromic salt which on decomposition with water yields A in its racemic form. However, when a solution of ferric chloride in glacial acetic acid is added to a chloroform solution of A, the deep violet halochromic salt so formed, on pouring into ice water, produces the original *l*-phenylbiphenyl- $\alpha$ -naphthylmethylthioglycolic acid with no racemization.

The fact that the halochromic salt with ferric chloride on decomposition with water gives the original optically active thioglycolic acid derivative with no change in specific rotation is compelling evidence against quinoid formulation for the explanation of color. A detailed account of these experiments will be published shortly.

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#### THE VELOCITY OF ADSORPTION PROCESSES AND THE PROBLEM OF PROMOTER ACTION

*Sir:*

In a recent note [THIS JOURNAL, 52, 5298 (1930)] and in greater detail in a communication to the February issue of THIS JOURNAL, the data relative to the concept of activation energy of adsorption processes has been indicated. In these contributions it was emphasized that the magnitude of the activation energy and, hence, of the velocity of adsorption at a given temperature, is determined not only by the adsorption process in question but also by the nature of the surface area on which the process occurs. We can now record some striking examples of this view which bear fundamentally on the problem of promoter action in catalysis. We have found that on an active manganous oxide catalyst hydrogen is adsorbed immeasurably slowly at 0 and 100°. At 184° the initial rate of absorption in a given adsorption system was 8 mm. per hour. At 305° the velocity of adsorption had risen to 78 mm. per hour, which corresponds to an activation energy in the neighborhood of 10,000 calories. The hydrogen was reversibly adsorbed since it could be recovered quantitatively by evacuation at higher temperatures. To compare these data with a promoted catalyst we have now studied a manganous oxide-chromium oxide catalyst. This again shows an extremely slow rate of adsorption at 0°, but at 184°, in a system comparable to that used with manganous oxide, the velocity of adsorption had risen to approximately 100 mm. per *minute*. The velocity of adsorp-

tion had thus increased about 700-fold by reason of the promoter action of the chromium oxide. The promoted catalyst also showed a much increased adsorptive capacity per gram. The gas was reversibly adsorbed. It is evident, therefore, that in considering the mechanism of promoter action consideration must be given not only to extension of surface but also to the velocities with which the activating adsorptions occur.

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### NEW BOOKS

**Die Bedeutung der wissenschaftlichen Tätigkeit Friedrich Wöhlers für die Entwicklung der deutschen chemischen Industrie.** (*The Importance of Friedrich Wöhler's Scientific Achievements in Developing German Chemical Industry.*) By Dr. TH. KUNZMANN. Verlag Chemie, G. m. b. H., Berlin W 10, Germany, 1930. 90 pp. 15.5 × 23.5 cm. Price, unbound, R.M. 4.

Within the space of ninety pages the author includes those discoveries by Wöhler that led to important technical processes, as well as his purely scientific achievements. He presents in thirteen chapters an admirable survey of all this great pioneer did, beginning with a list of Wöhler's papers, 223 in all, upon 160 inorganic, 54 organic and 9 biochemical subjects. Those were days when a man was a general practitioner, unconfined to a special field but roaming at will and able to say truthfully, "I am a chemist." In the second chapter is Wöhler's biography and in the next four are such technically important discoveries as the isolation of aluminum in 1827, contact production of sulfuric acid in 1852, explanation of the nature of calcium carbide with suggestions as to its use in 1862, and experiments upon titanium in 1849. Fourteen additional inorganic researches of technical significance appear in the eighth chapter, among the number being the extraction of phosphorus, refining of antimony and oxidation of ammonia.

No book about Wöhler would be complete without mention of his announcement in 1828 of the synthesis of urea. In the ninth chapter the author takes up this discovery that has overshadowed much of Wöhler's other work. The birth of modern synthetic chemistry dates from this epoch-making experiment that spurred chemists to attempt similar syntheses. The two following chapters call attention to other organic researches by Wöhler, such as those upon alkaloids and quinone, the latter leading to the preparation of hydroquinone and quinhydrone. In its subsequent development quinone chemistry has proved a fruitful field of research. His organic experiments led Wöhler to devise several ingenious methods, for example, the use of the sealed tube.