hydrogen from 450°, it was found capable of effecting only a 12% conversion at −190°. Furthermore, exposing a sample of helium-cooled catalyst to hydrogen at 100° and 760 mm. pressure for 5, 15, 30, 60, 120 and 200 minutes resulted in the catalyst being able to effect 43, 20, 16, 15, 10 and 15% conversion, respectively, at −190°; similar exposure of a sample to hydrogen at 200° for 15, 30 and 60 minutes left the catalyst able to effect a 32% conversion in each case. These data combined with measurements that have been made on the rate and amount of hydrogen adsorbed by the catalyst at 100 and 200° appear to indicate definitely that the activated adsorption of hydrogen at the higher temperatures is primarily a surface adsorption and not a solution within the iron sample. If this inhibitive effect of high temperature hydrogen adsorption on the low temperature conversion activity of metal catalysts proves to be a general one, it should be a useful tool for differentiating between the adsorption of gases by catalyst surfaces and solution within metal catalysts.

Permitting the promoted catalyst to take up oxygen between room temperature and 450° almost eliminates its high temperature activity toward the para-ortho conversion but only slightly impairs the activity toward the conversion at −190°. Since the iron oxide that would be formed first by the reaction of oxygen and iron is magnetite (Fe_3O_4), the retention of activity at −190° by the partially oxidized catalyst is perhaps not surprising for as Bonhoeffer, Farkas and Rummel [*Z. physik. Chem.*, **B21**, 225 (1933)] and Taylor and Diamond [THIS JOURNAL, **55**, 2613 (1933)] have suggested, the low temperature conversion may be associated with magnetic characteristics of the catalyst surface.

U. S. DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.
R. W. HARKNESS
P. H. EMMETT

RECEIVED JUNE 19, 1933 PUBLISHED AUGUST 5, 1933

THE LOW TEMPERATURE ABSORPTION SPECTRUM OF PEPSIN

Sir:

Preliminary measurements indicate that pepsin has an absorption band in the ultraviolet in the region 2600–2900 Å. If the pepsin is cooled, say to −100°, then it is found that this wide band is "resolved" into a number of sharp, narrow bands. At the present time it appears probable that certain of these bands may be correlated with activity.

It has also been found that proteins such as serum albumin and egg albumin show narrow band formation at low temperatures. It seems that there is a difference in the temperature required to produce the narrow bands in the case of the albumins and that of pepsin; apparently a lower temperature is necessary for pepsin.

The apparatus used in the low temperature work is very simple and is

shown in the accompanying diagram. It consists essentially of two concentric tubes and the cooling is produced by the circulation of pre-cooled nitrogen. The design is after a suggestion of Dr. F. Simon.

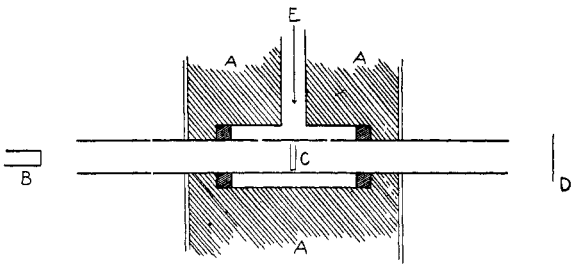

Fig. 1.—A, Lagging (cotton waste); B, hydrogen discharge tube; C, pepsin; D, spectrograph; E, pre-cooled nitrogen.

Further details will be published shortly.

FRICK CHEMICAL LABORATORY OF PRINCETON UNIVERSITY AND THE ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH
PRINCETON, N. J.
G. I. LAVIN
J. H. NORTHROP
H. S. TAYLOR

RECEIVED JUNE 21, 1933 PUBLISHED AUGUST 5, 1933

THE REACTION BETWEEN ATOMIC HYDROGEN AND CARBON TETRACHLORIDE

Sir:

Previous studies on the reactions of atomic hydrogen with organic compounds have not yielded information about the mechanisms of these changes, due to the complexity of the products and to the large number of consecutive reactions taking place. In a recent series of experiments, it has been found that the reaction between atomic hydrogen and carbon tetrachloride vapor leads to the formation of relatively simple products in addition to the high polymers usually found.

The apparatus is of the conventional type: carbon tetrachloride vapor is admitted to a stream of atomic hydrogen drawn from a Wood discharge tube, the pressure in the reaction zone being maintained at about 0.7 mm. The volatile products of the reaction, together with the unchanged carbon tetrachloride, are frozen out in a liquid air trap.

That extensive reaction takes place is shown by the heat evolved in the reaction zone, the presence of considerable hydrogen chloride in the liquid air trap, the deposition of a solid product on the walls of the reaction chamber, and, if the pressure is sufficiently low, a moderately intense greenish-blue luminescence, appearing at the region of mixing. The solid product is soluble in carbon tetrachloride, but decomposes without melting slightly below red heat. It contains about 55% chlorine and does not