mid-point of neutralization curves of fatty acids. Since the variation of collapse pressure with *p*H may be considered as related to neutralization, this appears to be evidence of increased activity of palmitic acid when oriented on a water surface.

The collapse pressure was specific for hydrogen ions alone, although increased spread at low pressures was noticed when calcium or magnesium ions were present in the hydrochloric acid solution. A specific effect, in causing what may be either collapse or solution of the film at room temperatures, has been noticed in the case of neutral potassium permanganate solutions. This was not noticed with hydrogen peroxide, potassium ferricyanide or potassium dichromate solutions.

In view of the work of Cary and Rideal [*Proc. Roy. Soc.* (London), **A109,** 301 (1925)] on the spreading of fatty acid crystals on acid solutions, which indicates that many of the films should be thermodynamically unstable above 8 dynes, in the neighborhood of 20°, work is now in progress on a repetition of the above studies, using mixtures of higher hydrocarbons, such as tetradecane, with palmitic and other acids, to determine whether this relation between collapse pressure and hydrogen-ion concentration holds for an interface where the acid film may collapse in a reversible manner. It is planned further to apply thermodynamic interpretation, such as Harkins' spreading coefficient to the collapse phenomena. The results with the monomolecular films alone will be reported more fully in the near future, together with those obtained with mixed films.

DEPARTMENT OF CHEMISTRY
UNIVERSITY OF CHICAGO
CHICAGO, ILLINOIS
ROBERT J. MYERS

RECEIVED OCTOBER 17, 1935

THE ACTIVATION OF SPECIFIC BONDS IN COMPLEX MOLECULES AT CATALYTIC SURFACES

Sir:

It has now become possible to examine the activation of specific bonds in complex molecules at catalytic surfaces, a fundamental problem in surface catalysis, that of specificity. We shall illustrate a method capable of quite general applicability by a specific example, that of the molecule ethane. In this we are concerned with two types of bond, the C–C and the C–H bond. We have followed the activation of these bonds on an active nickel surface by the study of the two reactions (a) the exchange reaction $C_2H_6 + mD_2 \longrightarrow C_2H_xD_y$ where $x + y = 6$ and m may be varied arbitrarily; (b) $C_2H_6 + H_2 = 2CH_4$. The former involves only the C–H, the latter the C–C bond, the other reactant in each case being hydrogen (or deuterium) adsorbed on the surface in the activated form. We find that, on this catalyst, the exchange reaction proceeds quantitatively at 138° under conditions in which reaction (b) is quite negligible. The production of methane sets in, under our conditions about 150° and is sensibly complete around 200°. We thus define the temperature, catalyst and reactant concentration conditions necessary to activated adsorption of ethane molecules producing either the C–H or the C–C bond split or both. By extension of these studies to other catalyst surfaces, to molecules which contain a wide variety of other bonds, *e. g.*, O–H, N–H, C–O, C–N, etc., and to varied operating conditions we plan to determine in detail the factors which produce specific activity of catalysts in general.

FRICK CHEMICAL LABORATORY
PRINCETON UNIVERSITY
PRINCETON, N. J.
HUGH S. TAYLOR
KIYOSHI MORIKAWA
W. S. BENEDICT

RECEIVED NOVEMBER 8, 1935

SYNTHESIS OF DEUTERO-ACETALDEHYDE

Sir:

By absorbing deutero-acetylene in an acid solution of mercury salts in deuterium oxide we have succeeded in synthesizing deutero-acetaldehyde. About 25 cc. have been prepared so far. The aldehyde freed from deuterium oxide by repeated distillations at low temperatures is a colorless mobile liquid. Preliminary determinations indicate a vapor pressure of 327 mm. at 0°. It shows the usual aldehyde reactions: reducing ammoniacal silver solutions, forming a white crystalline compound with ammonia and a phenylhydrazone with phenylhydrazine.

The D_2O used in generating the acetylene and in the absorbing solution was 99.6% pure. The burning of about 2 cc. of the aldehyde over copper oxide in a current of oxygen gave D_2O of 99.2% purity, both values determined by the interferometer method.

The determination of the physical constants of this compound as well as its chemical properties is proceeding in this Laboratory.

HAVEMEYER LABORATORY
COLUMBIA UNIVERSITY
NEW YORK CITY
J. ENRIQUE ZANETTI
DARRELL V. SICKMAN

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