oxanilide and other derivatives proceeds more rapidly when using the phenyl ester.

By the use of the aryl esters a method of obtaining N-substituted amides is available which is much more suitable than the one employing ethyl esters, ordinarily used. The phenol formed by the reaction can be removed easily by the addition of aqueous sodium hydroxide and filtering off the amide from the soluble phenolate. In some cases steam distillation of the phenol is possible. Aryl esters are easily obtained by treating a mixture of the phenolic compound and the free acid with phosphorus oxychloride. Of course, for preparation of the carbonate, phosgene is used.

CONTRIBUTION FROM THE
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RECEIVED DECEMBER 10, 1929
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COMMUNICATIONS TO THE EDITOR

PHOTOSENSITIZATION BY AMMONIA

Sir:

A research by Farkas, Haber and Harteck[1] on the photosensitization of the oxidation of hydrogen and carbon monoxide by means of ammonia is so similar in concept to work at present in progress in this Laboratory that it seems desirable to record immediately our data already obtained.

The illumination of mixtures of ammonia and ethylene at room temperatures and 100° by a mercury arc produces a rapid reduction in pressure which does not obtain with ethylene alone or with ethylene–hydrogen mixtures. It is not, therefore, a mercury resonance-radiation effect but is determined by the ammonia. During the reaction an oil separates which, as it accumulates, slows down the reaction rate.

By analogy with our earlier work[2] with excited mercury one might attribute the pressure change to a polymerization of ethylene under the influence of atomic hydrogen liberated in the photodecomposition of ammonia. We have shown, however, that in the presence of ethylene the normal decomposition of ammonia is much retarded. In the presence of 15 cm. of ethylene the photodecomposition of 5 cm. of ammonia is reduced to 5% of the normal rate. A further distinction from the work with excited mercury is found when hydrogen is present in the reaction system. With hydrogen, ethylene and ammonia an equally rapid pressure decrease occurs on illumination but no hydrogen disappears. Hence, even in presence of hydrogen, the reaction is one of polymerization.

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[1] Farkas, Haber and Harteck, *Naturwissenschaften*, **18**, 266 (1930).

[2] Taylor and Hill, THIS JOURNAL, **51**, 2922 (1929).

Over a wide concentration range the rate of reaction is independent of the ethylene concentration and increases with increasing ammonia concentration. The temperature coefficient is low and of the order of 1.03 per 10°. The quantum yield is of the order of unity if that for ammonia is taken as 0.2.

We are dealing, therefore, with a polymerization of ethylene photosensitized by ammonia. The retarded decomposition of the ammonia is of very great importance since it has been assumed of molecules showing predissociation spectra that absorption leads to decomposition without collision within $\sim 10^{-12}$ sec. In our pressure range (5–15 cm.) the collisions occur only after $\sim 10^{-9}$ sec. It is, therefore, difficult to account for the retarded ammonia decomposition on the present accepted ideas concerning predissociation. We are pursuing this work.

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HUGH S. TAYLOR
H. J. EMELEUS[3]

RECEIVED APRIL 17, 1930
PUBLISHED MAY 8, 1930

A CAPILLARY MERCURY-VAPOR LAMP

Sir:

A simple mercury-vapor lamp of high intensity has been developed in this Laboratory. It is cheap and easily constructed so that one can afford to operate it at a considerable overload for photochemical investigations. These lamps have been used in several different researches and they have been tested by friends in other laboratories.

The lamp is made from clear fused quartz tubing, 10 cm. long with an inside diameter of 1.5 mm. and an outside diameter of 4 mm. Three bulbs are blown, the first 15 mm. from the top, the second 20 mm. and the third 40 mm. from the top. The ends are constricted to enclose the tungsten electrodes, 0.75 mm. in diameter. The upper electrode is sealed in with fused silver chloride, the proper amount of pure mercury is introduced and the second electrode is sealed in with silver chloride. The electrodes are connected to copper wires and covered with de Khotinsky cement, which insulates the wires and makes the seals gas tight. The upper electrode is long enough to reach through the uppermost bulb and nearly to the second bulb. The mercury reaches to the bottom of the uppermost bulb and the remaining air space serves as an expansion chamber.

The lamp is held in a vertical position over a funnel and a water jet is mounted just above it. It is started by adjusting the resistance in series with the lamp, closing the circuit (500 or 110 volts d. c.), and separating the mercury thread between the second and third bulbs (20 mm. apart)

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[3] Commonwealth Fund Fellow.

with a small Bunsen flame or an electric heating coil. As soon as the arc strikes, a stream of water is immediately run over the lamp. Soft water or distilled water should be used. The lamps operate satisfactorily on 3 to 5 amperes with a potential drop of 60 to 300 volts. The upper electrode is positive.

The intensity varies with the individual lamps but the intensities on the different lines have been found to be approximately ten times or more as great as those obtained with commercial lamps operating under normal conditions. Uranyl oxalate has been decomposed at the rate of 0.5 g. of oxalic acid per minute using a cylindrical cell around the lamp. Raman effects have been observed with shorter exposures than are required with other lamps.

Some lamps have given fifty hours of service but when operated at very high intensity they usually fail after ten hours. Many lamps have shown but little decrease in intensity over the first few hours.

The lamp described here is particularly useful for illuminating spectrometer slits or for irradiating small volumes of material. Experiments are being continued also with metals other than mercury.

LABORATORY OF PHYSICAL CHEMISTRY
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LAWRENCE J. HEIDT
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RECEIVED APRIL 29, 1930
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NEW BOOKS

Einführung in die theoretische Wirtschaftschemie. (Introduction to the Principles of Economic Chemistry.) By Dr. Phil. RUDOLF KOETSCHAU. Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany, 1929. xii + 155 pp. 13 figs. 15.5 × 23.5 cm. Price, unbound, RM. 12; bound, RM. 13.50.

Scientists in the past, starting from the known or central truth of phenomena, have tended to explore outward almost exclusively along the straight line of their own discipline. Chemists stuck to chemistry, and biologists to biology.

In the last few decades, however, there has been a steady obliteration of boundary lines, and a continually increasing coöperation among specialists. Research in the no man's land between the natural sciences is bringing astounding results, now partly embodied in texts on physical chemistry, biochemistry, astrophysics and the like. The social scientists have likewise exchanged results among themselves. But the natural sciences and the social sciences have generally been thought in the main to lie in different strata.

Dr. Koetschau does not think so. In fact, he believes that a new science ought to be recognized: economic chemistry or chemical economics. It