Chemists Invade Field of Vital Products

Chemistry

Following are reports of the meeting of the American Chemical Society at Swampscott, Massachusetts.

How coal and petroleum and natural gas may serve as sources of alcohols was one of the practical questions discussed at the meeting of the American Chemical Society. This does not imply that the chemists disclosed any simpler or cheaper method for the manufacture of that alcohol which is prohibited for sale as a beverage by the Volstead Act, for they were concerned with other and more useful members of the numerous alcohol family, such as those used as solvents in the lacquers which have recently risen in popularity. In 1927 about twenty-five million gallons of these lacquers were manufactured in this country. This is more than ten times the amount produced five years before. They have largely replaced paint and varnish for finishing automobiles and are rapidly invading other fields. They bear different trade names, but consist essentially of dissolved cellulose, made by treating cotton or woody stuff with nitric acid and then dissolving it in various alcoholic and etherial liquids. The preparation of the necessary solvents by the distillation of wood and the fermentation of corn has promoted new industries, but these are now threatened by the possibility of making them cheaper from fossil fuel. Arthur D. Little of Cambridge, Mass., announced the results of the new method of breaking up petroleum as carried on a large scale in the plant at Tiverton, R. I. One barrel of gas oil gives 46 per cent. of motor fuel, five gallons of the higher alcohols and 800 cubic feet of useful gas of which a fourth consists of ethylene.

This gas has recently been found to be a valuable anesthetic and also is extensively used for ripening fruit. Ethylene may also prove an aid to agriculture in another way for certain of its derivatives are found to have the useful knack of speeding up plant growth. Seed potatoes so treated sprout nearly two months earlier than otherwise and in many localities this makes it possible to grow two crops a year instead of one.

Yeast to Replace Beef

Dr. Little hinted at a still more revolutionary change in agriculture in the possible replacement of beef cattle by yeast plants. "Whereas it requires about 100 pounds of foodstuffs to produce three pounds of beef and three acres of land to support a cow, thousands of pounds of solid yeast protein can be developed and separated in a few hours in a very limited space from molasses and many other wastes containing fermentable sugars. That the yeast plant may be given more duties to perform in the near future than making bread and beer is evident from other papers. Dr. Charles E. Bills told of the preparation from yeast of a white crystalline compound called "ergosterol," which is one of the new hard words that the public will have to learn some time, although it is so far unfamiliar even to chemists, and they are not yet agreed on its pronounciation. The British chemists' present accent it on the third syllable and the American on the second. But the newcomer is important, whatever they call it, for it can be converted by the rays of the sun or mercury arc lamp into Vitamin D, which keeps babies from growing up with bow legs and poor teeth. This is the first of the vitamins to be made artificially and is so pure and potent that the addition of one part in a billion of the food will prevent rickets.

Radio Panels From Gas

A new and apparently profitable employment for natural gas was pointed out by T. E. Layng and R. Soukup. Experiments at the State University of Illinois have shown that methane can be easily and quickly and presumably cheaply converted into formaldehyde. Now the raw material, methane, is the chief constituent of natural gas, which runs to waste in some parts of our country as we may see by the flaring torches burning all night in localities needing no illumination. And the product, formaldehyde, is familiar to all of us under the name of "formalin," since it is in common use as a disinfectant. It is equally common, although not so familiar, as one of the two constituents of bakelite used in radio receivers, phonograph receivers, phonograph records and automobiles. The other component of this synthetic plastic is the well-known disinfectant, carbolic acid, obtained from coal-tar. The Illinois investigators get as high as 30 per cent. of the methane transformed by a single passage of the gas, together with oxygen, through a small glass tube heated to a temperature of 690 degrees centigrade and without the need of the high pressure that previous investigators have been obliged to employ. The secret of their success is the use as the catalyst, or combining agent, of a small amount of one of the oxides of nitrogen, the red fumes familiar to every beginner in chemistry. Other compounds produced from natural gas are formic acid and methanol and products in predominant proportions.

Methanol, commonly called "wood alcohol," is employed as a denaturant to render alcohol unfit to drink and some of our citizens have found, to their sorrow, that it is not the same thing as grain alcohol. It used to be made by the distillation of wood, but a few years ago German chemists found out a way of making it from coal and have since been exporting it to America. But if it can be made still cheaper from natural gas we may regain the native industry.

Chemistry Growing Too Fast

The chemical industries suffer from the rapid progress of chemical science. At the Nitrogen Symposium almost all the speakers took occasion to point out that the plants built during the war for the fixation of atmospheric nitrogen for explosives, like that at Muscle Shoals, were obsolete and incapable of competing with processes invented since. In the early and antiquated methods, meaning those of ten years ago, the chief requisite was cheap power. Now cheap hydrogen is more sought.

H. R. Bates of International Agricultural Corporation reported that the world's consumption of inorganic nitrogen for the year ended June 30, 1928, was 1,600,000 metric tons, more than twice what was used in 1913. Of this output nearly a million tons is now extracted from the air by factories. The rest is about evenly divided between the nitrogen obtained from the nitrate beds of Chile and that coming as a by-product of coke ovens. It is a curious situation, and fortunate for us, that there are three independent sources in competition to supply the soldier and the farmer and the family refrigerator with the nitrogen they need, a mineral deposit, a continuous industry, and the fixed nitrogen factory that can be expanded at will.

Chemists Invade Field of Vital Products—*Continued*

How the chemist broke through the barrier between the mineral kingdom and the vegetable and animal kingdoms a hundred years ago, and how far he is likely to go in the production of artificial compounds in the future was the theme of the opening discourse of the distinguished British chemist, Dr. Jocelyn Field Thorpe of the Imperial College of Science and Technology, London, at the first session of the American Chemical Society.

The society meets on the centennial of an epoch-making event in the history of science, the synthesis of urea by the German chemist, Friedrich Wöhler of Göttingen University. This achievement dissipated the ancient superstition that some mysterious vital force was essential to the formation of the foods, flavors, perfumes, drugs and dyestuffs which had hitherto been found only in plants and animals. But when Wöhler in 1828 succeeded in preparing urea, a waste product of animal life, from ammonium cyanate, a well-known salt, the discovery opened the way to the manufacture of an immense variety of useful compounds during the next century, ranging from such dyes as indigo to such medicines as camphor. The latest chemical dictionary describes the making of some 400,000 compounds of carbon. Some of these are to be found in nature, but most of them were not in existence until they were made in the laboratory by chemists following in the footsteps of Wöhler. As to the future, Professor Thorpe says:

"It is pertinent to ask when additions to this already stupendous list are likely to cease. The answer is that it is never likely to cease and cannot cease so long as fundamental research work in organic chemistry is being carried on. These compounds are not, as certain of our maligners suggest, prepared for the sake of preparing them, but are merely steps incidental to the elucidation of some problem of fundamental importance to the progress of science. It is absolutely necessary that these should be recorded in order that subsequent workers in the same field may utilize them as sign-posts indicating the direction along the paths already trodden. In no other way can we hope to explore and map the unknown country ahead of us. I have heard it said that Organic Chemistry is reaching finality, but to those of us who know, the realization that we have only scratched the surface of things is very evident. Many natural substances such as strychnine, morphine and so forth, still evade the skill of the synthetic chemists. The wonderful researches of Willstätter, who has enriched every branch of the science he has touched, have indicated the manner in which the coloring matter of flowers and plants may be investigated."

Yeast Cure Century Old

Yeast as a remedy is nothing new. In a book on brewing, published in the United States in 1815, it was proposed by Joseph Coppinger. At the meeting of the chemical history division of the society, Howard M. Elsey called attention to this now nearly forgotten work.

It is especially interesting, he said, "because of its lengthy discussion of the theory of fermentation at the time of its printing in 1815. Coppinger, though a practical brewer, seems to have been very well read in science and to have had a keen appreciation of the value of research in industry."

Another paper presented before the same meeting told of the chemical experiments that James Madison conducted in the White House while he was President. He wanted to find out a reason for the supposed efficacy of certain Virginia spring waters in the treatment of consumption.

"Madison undertook their analysis according to the analytical technic of his day," Orville E. May told the chemists. "He determined the temperature and relative density of the water and analyzed it for the presence of iron, free acid, sulfide, sulfate, free hydrogen sulfide, copper, ammonia, carbonate and free carbon dioxide. He was prevented from continuing his experiments 'by a sudden alarm to which the frontiers were then continually exposed.'" This "alarm" was due to the British during the War of 1812 arousing the hostile Indians.

Sewers Require Chemists

"Sugar and spice and everything nice" were the original concerns of the chemist, for the earliest chemists were druggists, and dealt in fragrant things. But modern chemistry, which touches every aspect of civilized life, is under compulsion to investigate our very sewers, and though a sewage chemist's nose may be as nice as any other man's, he sticks to his necessary job just the same.

The division of the chemistry of water, sewage and sanitation had its innings at the meeting. Prof. A. M. Buswell of the University of Illinois, with two of his associates, S. L. Neave and A. L. Elder, told of their work in encouraging the digestive processes of the not-too-discriminating bacteria that feed on city waste and reduce it to an innocuous condition.

Following them, Dr. Willem Rudolfs of the New Jersey Agricultural Experiment Station, told of his struggle pollution in the Raritan river, a typical Eastern stream in its load of urban and factory wastes.

Dr. W. R. Copeland of the Connecticut State Water Commission, and Prof. C. R. Hoover of Connecticut Wesleyan University, told of the problems their small but highly industrialized state has to face in the dumping of wastes into its rivers. Paper mills, now among the worst offenders, can be civilized to a considerable extent by recovering the pulp now dumped out with the waste liquor and using the water thus clarified, they said. Textile plant wastes may be treated with iron to form an insoluble sludge, keeping the water clear and chemically sound, and other appropriate chemical means can be used by other industries to restore rivers to their lost decency.

How to Dye Rayon Evenly

Rayon stockings for women or shirts for men can now be dyed more evenly as a result of the discovery of why light stripes sometimes appear even in the best regulated plants. At the meeting of the dye chemistry division, Robert W. Jaeger, of Armour and Co., told of his latest researches.

Sometimes in dyeing rayon skeins, one skein will be found to be much brighter than the others, or if the rayon is woven in the piece with some other material, the lighter stripes will appear. The reason for this is that the offending fibers are not perfectly round, as they should be. Though manufacturing methods have been improved, so that this defect is not as common as it used to be, it still occasionally occurs. Microspopic examination of each fiber to see if it is round is impossible, so that methods have been discovered of making the dye stick even to the uneven fibers. The more acid a dye is, the more evenly it dyes.

England and Wales reported 14,767 cases of smallpox last year, or more than all the rest of Europe together.

The mile-long tunnel that is being bored through solid sandstone in Zion Canyon, Utah, is nearing completion.