Coal Research

THE increasingly voracious appetite of the organic chemicals industry requires that increasing scientific attention be devoted to the largest stockpile of carbonaceous material available—the huge reserves of coal still buried beneath the soils of America. The chemicals available as by-products from the conversion of coal to coke for the steel industry must necessarily remain restricted in quantity, since large increases in the tonnage of steel production do not appear imminent. The mandatory development of other processes for the production of chemicals from coal has been severely handicapped by a critical lack of fundamental information concerning the chemical and physical structure of coals and their degradation products.

In 1928, in his address of welcome to the second International Conference on Bituminous Coal, the late Thomas S. Baker stated that "in Pittsburgh we should have a great research establishment for the study of coal—one which should employ not only the services of men who are striving to perfect the processes which have already been thought of, but also men who occupy themselves with the basic conceptions of physics and chemistry, and who see in a lump of crude bituminous coal an opportunity of finding an answer to some of the enigmas of nature." Pursuing vision with initiative, Dr. Baker, then president of the Carnegie Institute of Technology, established the Coal Research Laboratory with the dual objectives "to do fundamental research in coal and derived products" and "to train students in coal technology."

In the twenty-two years since it was founded, the Coal Research Laboratory has become one of the world's most important centers of coal research. It has actively pursued fundamental investigations on the mechanism of thermal decomposition of coals and of their chemical structure, as elucidated by studies of the primary thermal decomposition products obtained at low pressures, of the action of solvents over a wide range of temperatures, and of the chemical structures of the products resulting from controlled breakdown of coals by oxidation, hydrogenation, and halogenation reactions.

As a logical extension of the fruitful studies of oxidation, a pilot plant was developed to evaluate costs, compile data, and investigate potential uses of the organic acids produced directly and readily by oxidation of coals.

Work on coal hydrogenation, which was started in 1932, has helped to interpret the general mechanism of the hydrogenation reaction and to determine the yields and the nature of the intermediate products. Additional studies on the mechanisms and techniques of gasification and combustion reactions and on methods of coke evaluation, statistical analyses of published data, and reviews of current literature have helped to eliminate serious gaps in our basic knowledge of coals and their uses.

The sum total of basic information accumulated in this and other laboratories of the world has accumulated to the point where the direct production of chemicals from coal will soon be a commercial reality. In this respect the most significant development has been the recent disclosure that the Carbide and Carbon Chemicals Corporation has constructed a pilot plant for the hydrogenation of coals to chemicals. The signal success of this giant of the chemical industry in previous ventures bespeaks excellent chances of financial success in this one. Even more important, it presages a diminishing reluctance on the part of the rest of the chemical industry to support and actively to pursue research on coal. It remains axiomatic that the more we know about coal, the more we shall do with it.

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