

the residue might find industrial utilization for certain purposes at a lower cost than carbon black. Electron micrographs (see fig. 81) reveal a very close similarity to commercial carbon blacks. The carbonaceous residue also can be burned in standard equipment, using powdered coal for underfiring boilers.

APPENDIX. - BIBLIOGRAPHY OF PAPERS AND REPORTS PRESENTED AND PUBLISHED DURING 1949

PROCESSING, Coal-to-Oil Demonstration Plants, Louisiana, Mo.

1. BATCHELDER, E. R., and STERNGERG, J. C. A Thermodynamic Study of Coal Gasification, PART I and II. Submitted for publication in Ind. Eng. Chem.
2. DONOVAN, J. T., JOCHIMAIS, M., and MARKOVITS, J. A. High-pressure Vessels in Coal Hydrogenation Service. Presented before the Petroleum Div. Meeting of the A.S.M.E., Okla. City, Okla., Oct. 2-5, 1949, and to be published in A.S.M.E. Trans.
3. HIRSH, L. L., MARCOVITS, J. A., SKINNER, L. C., DOUGHERTY, R. W., and DONAHUE, F. A. Estimated Plant and Operating Costs for Producing Gasoline by Coal Hydrogenation. Bureau of Mines Rept. of Investigations 4564, 1949, 83 pp.
4. HIRSH, L. L. Complete Coal-to-Oil Demonstration Plants. Industry and Power, August, 1949, pp. 90-93 and 116.
5. HIRSH, L. L., and CHAMBER, C. C. in collaboration with KASIMENS, M. L. (Assoc. Ed. Ind. Eng. Chem.). Liquid Fuel from Coal. Ind. Eng. Chem., vol. 41, pp. 870-885.
6. HIRSH, L. L., MARKOVITS, J. A., DRESSLER, F. G., and BATCHELDER, E. R. The Bureau of Mines Demonstration Plants in the Synthetic Fuels Picture. Presented before the American Gas Assn., Atlantic City, N. J., Oct. 1946, and published in A.G.A. Proc. May 1949.
7. LAUGHEY, P. W., GUTTMAN, W. I., SCHAFPERT, W., and MARKOVITS, J. A. Design of Preheaters and Heat Exchangers for Coal Hydrogenation Plants. Presented before the Petroleum Div. Meeting of the A.S.M.E. Okla. City, Okla., Oct. 2-5, 1949, and to be published in A.S.M.E. Transactions.
8. LEONARD, B. E., GARDNER, G. D., AND MARKOVITS, J. A. Metallurgical and Fabrication Considerations in the Coal Hydrogenation Demonstration Plant Construction. Presented before the Petroleum Div. Meeting of the A.S.M.E., Okla. City, Okla., Oct. 2-5, 1949, and to be published in A.S.M.E. Trans.
9. MARKOVITS, J. A. Coal Hydrogenation. Mech. Eng., vol. 71, No. 7, July 1949, pp. 553-560.
10. MARKOVITS, J. A., BRAUN, K. C., DONOVAN, J. T., and SANDAKER, J. H. Special Equipment in the Coal Hydrogenation Demonstration Plant. To be published by the Bureau of Mines as Rept. of Investigations 4564.
11. MARKOVITS, J. A. The Coal Hydrogenation Demonstration Plant at Louisiana, Mo. Presented before the Petroleum Div. Meeting of the A.S.M.E., Okla. City, Okla., Oct. 2-5, 1949, and to be published in A.S.M.E. Trans.
12. MARKOVITS, J. A., BRUNO, G. L., and GHYER, F. W. Instrumentation for Coal Hydrogenation Service. Presented before the Petroleum Div. Meeting of the A.S.M.E., Okla. City, Okla., Oct. 2-5, 1949, and to be published in A.S.M.E. Trans.
13. SANDAKER, J. H., BREITSCENEIDER, K. B., and MARKOVITS, J. A. High-Pressure (10,300 PSI) Piping, Flanged Joints, Fittings, and Valves for Coal Hydrogenation Service. Presented before the Petroleum Div. Meeting of the A.S.M.E., Okla. City, Okla., Oct. 2-5, 1949, and to be published in A.S.M.E. Trans.

14. SYMONDS, F. L., LAUGIREY, P. W., DONATH, E. E., SKINNER, L. C., and BATCHELDER, H. R. Public Utility Gas as a Byproduct of Synthetic Liquid Fuels Production. Presented before the American Gas Assoc., New York, N. Y., May 23-25, 1949, and published in A.G.A. Proc. May 1949.
15. VAN HOY, C. W., DUNVILLE, T. C., DRESSLER, R. G., and CHAFFEE, C. C. Guide for Making Cost Estimates for Chemical-Type Operations. Bureau of Mines Report of Investigations 1534, 1949, 64 pp.

RESEARCH AND DEVELOPMENT, Coal to Oil Laboratories and Pilot Plants, Bruceton and Pittsburgh, Pa.

1. SAVICH, T. R., PELIPETZ, M. G., BUDY, W. A., CLARK, E. L., and STORCH, H. H. Stripping of Coal-Hydrogenation Heavy-Oil Slurry. Ind. Eng. Chem., vol. 41, 1949, pp. 968-971.
2. WELLER, S., PELIPETZ, M. G., KUEN, M., FRIDMAN, S., and CLARK, E. L. Hydrogenation of Coal in Batch Autoclaves with Coke Oven Gas. Ind. Eng. Chem., vol. 41, 1949, pp. 972-973.
3. COLUMBIC, N. Chemicals from the Products and By-Products of Synthetic Liquid Fuels Processes. Bureau of Mines Rept. of Investigations 4457, 1949, 58 pp.
4. ORCIN, M., WOOLFOCK, W. O., and REGGEL, L. Aromatic Cyclodehydrogenation. VIII. Experiments with 2-Benzoyl-5, 6, 7, 8-tetrahydronaphthalene. Jour. Am. Chem. Soc., vol. 71, 1949, p. 1126.
5. WOOLFOCK, W. O., and ORCIN, M. Preparation of 2, 4, 7-Trinitrofluorenones. Org. Syn., vol. 28, 1948, p. 91.
6. ANDERSON, R. B., KRIEG, A., SELIGMAN, B., and TARN, W. I. Fischer-Tropsch Cobalt Catalysts. Influence of Type of Kieselguhr. Ind. Eng. Chem., vol. 40, 1948, pp. 2347-2351.
7. ANDERSON, R. B., HALL, W. E., KRIEG, A., and SELIGMAN, B. Studies of the Fischer-Tropsch Synthesis, V. Activities and Surface Areas of Reduced and Carburized Cobalt Catalysts. Jour. Am. Chem. Soc., vol. 71, 1949, pp. 183-188.
8. STORCH, H. H., ANDERSON, R. B., HOFER, L. J. E., HAWK, C. C., ANDERSON, H. C., and COLUMBIC, N. Synthetic Liquid Fuels from Hydrogenation of Carbon Monoxide, Part I. Review of Literature: Bureau of Mines Research on Effect of Catalyst Preparation, Reduction, and Induction Procedures on Activity; Correlation of Physical Properties of the Catalysts with Their Activity. Bureau of Mines Tech. Paper 709, 1948, 213 pp.
9. HOFER, L. J. E., JOHN, E. M., and PEPELES, W. C. The Modifications of Carbide Fe_2C ; Their Properties and Identifications. Jour. Am. Chem. Soc., vol. 71, 1949, pp. 189-195.
10. WEINTRAUB, M., and LEVA, M. Pressure Drop in Packed Tubes - A Nomogram. Chem. Eng. Progress, vol. 44, 1948, pp. 801-802.
11. LEVA, M. Fluid Flow Through Packed Beds. Chem. Eng., vol. 55, 1949, p. 115.
12. LEVA, M., WEINTRAUB, M., GRIMMER, M., and POLACHIK, M. Fluidization of Anthracite Coal. Ind. Eng. Chem., vol. 41, 1949, pp. 1206-1212.
13. HAWK, C. C., COLUMBIC, N., and HOFER, L. J. E. Catalyst for Hydrocarbon Synthesis. U. S. Patent 2,449,071, Sept. 14, 1948.
14. FELDMAN, J., MYERS, M., WENDER, I., and ORCIN, M. Evaluation of Vacuum Rectification Columns. Use of Binary Mixtures. Ind. Eng. Chem., vol. 41, 1949, pp. 1032-1036.
15. WENDER, I., FRIEDEL, R. A., and ORCIN, M. Preparation of High-Purity Hydrogen Duterile from Lithium Aluminum Hydride. Jour. Am. Chem. Soc., vol. 71, 1949, p. 1140.

16. ORCHIK, M., GOLDBECK, G. L., WOLAK, M., and STORCH, E. J. Coal Hydrogenation. The Effect of Variations in the Coal-to-Vehicle Ratio. Bureau of Mines Report of Investigations 4499, 1949, 10 pp.
 17. BERGMANN, E., and ORCHIK, M. Synthesis of Fluoranthene and Its Derivatives. Jour. Am. Chem. Soc., vol. 71, 1949, p. 1917.
 18. ORCHIK, M., and WENDER, I. Apparatus for Measuring Gas Absorption or Evolution During Organic Reactions. Anal. Chem., vol. 21, July 1949, p. 875.
 19. KRIEG, A., DUDASH, A., and ANDERSON, R. B. Improved Caustic Scrubber. Ind. Eng. Chem., vol. 41, July 1949, p. 1502.
 20. ORCHIK, M. Synthesis of Perylene. U. S. Patent 2,478,200, Aug. 9, 1949.
 21. COLUMBIC, C., ORCHIK, M., and WELLER, S. Partition Studies of Phenols, I. Relation Between Partition Coefficient and Ionization Constant. Jour. Am. Chem. Soc., vol. 71, 1949, pp. 2624-2627.
 22. COLUMBIC, C. Partition Studies of Phenols, II. Separation of Isomeric Phenols by Countercurrent Distribution. Jour. Am. Chem. Soc., vol. 71, 1949, pp. 2627-2629.
 23. ORCHIK, M., REGGEL, I., and FRIEDEL, R. A. Aromatic Cyclodehydrogenation, IX. Further Studies on Ring Oxygen Compounds. Jour. Am. Chem. Soc., vol. 71, 1949, pp. 2743-2746.
 24. ORCHIK, M. Solvation and Depolymerization of Coal. U. S. Patent 2,476,999, July 26, 1949.
 25. LEVA, M., WEINTRAUB, M., and GRUMMER, M. Heat Transmission Through Fluidized Beds of Fine Particles. Chem. Eng. Progress, vol. 45, 1949, pp. 563-572.
 26. FRIEDEL, R. A., and SHARKEY, A. C. Mass Spectrum of Hydrogen Deuteride, HD. Jour. Chem. Physics, vol. 17, 1949, pp. 584-585.
 27. ORCHIK, M., WENDER, I., and FRIEDEL, R. A. Determination of Deuterium in Water. Anal. Chem., vol. 21, 1949, pp. 1072-1073.
 28. ORCHIK, M. and FRIEDEL, R. A. Structure of the Benzofluorenes and the Benzofluorenones. Jour. Am. Chem. Soc., vol. 71, 1949, pp. 3002-3005.
 29. COLUMBIC, N., ANDERSON, H. G., and CRAFF, R. C. Revised Bibliography of Bureau of Mines Investigations on the Production of Liquid Fuels from Oil Shale, Coal, Lignite, and Natural Gas (to 1949). Bureau of Mines Inf. Circ. 7534, 1949, 53 pp.
 30. PICHLER, H., MERKEL, H., BRINKLEY, R., and HOFER, L. J. E. Chemical and Thermomagnetic Studies on Iron Catalysts for Synthesis of Hydrocarbons. Bureau of Mines Tech. Paper 718, 1949, 108 pp.
 31. PELTZER, M. G., KUHN, E. M., FRIEDMAN, S., and STORCH, H. H. Studies of the Kinetics of Coal Hydrogenation. Bureau of Mines Rept. of Investigations 1564, 1949, 9 pp.
 32. ANDERSON, R. B., KRIEG, A., FRIEDEL, R. A., and MASON, L. S. Studies of Fischer-Tropisch Process, VI. Differential Reaction Rate Studies with Cobalt Catalysts. Ind. Eng. Chem., vol. 41, 1949, p. 2189.
- RESEARCH AND DEVELOPMENT, Synthesis-Gas Laboratories and Pilot Plants, Morgantown, W. Va., and Corgas, Ala.
1. ALBRIGHT, C. W., HOLDEN, J. E., SIMONS, E. P., and SCHMIDT, L. D. Pneumatic Feeder for Finely Divided Solids. Chem. Eng., vol. 56, June 1949, pp. 108-111.
 2. DOTSON, J. M., HOLDEN, J. H., SEIBERT, C. B., SIMONS, E. P., and SCHMIDT, L. D. New Method Measures Solid:Gas Ratio in High-Solid Flow. Chem. Eng., vol. 56, October 1949, pp. 128-130.

3. FEES, M. H., and ELDER, JAMES L. Laboratory and Field-Scale Experimentation on the Underground Gasification of Coal. Presented at United Nations Scientific Conference on the Conservation and Utilization of Resources, Lake Success, New York, Aug. 17-Sept. 6, 1949.
4. FEES, M. H., ELDER, JAMES L., GRAHAM, HUGH G., MONTGOMERY, R. C., and JERNIGAN, J. M. The Second Underground Gasification Experiment at Gorgas, Alabama. Descriptive pamphlet, February 1949.
5. SANDS, A. E., GRAFIUS, M. A., WATINWRIGHT, H. W., and WILSON, M. W. The Determination of Low Concentrations of Hydrogen Sulfide in Gas by the Methylene Blue Method. Bureau of Mines Report of Investigations 4547, 1949, 19 pp.

GENERAL - Washington, D. C.

1. CRENTZ, W. L., DOHERTY, J. D., and DOMATH, E. E. Coal Preparation for Synthetic Liquid Fuels. Presented before the Coal Division meeting of the A.I.M.E., Columbus, Ohio, Sept. 27, 1949, and to be published in the A.I.M.E. Mining Trans.
2. DOHERTY, J. D. Synthetic Oil from Coal. Presented at the Seventy-Fifth Anniversary Celebration of the Colorado School of Mines, Oct. 1, 1949, and to be published in the Colorado School of Mines Quarterly.
3. DOHERTY, J. D. Synthetic Liquid Fuels from Coal. A.I.M.E. Mining Trans., Min. Eng., vol. 1, No. 4, April 1949, pp. 116-124.
4. SCHROEDER, W. C. Oils from Petroleum, Coal, and Soils. Presented before the Oil-Heat Institute of America, Boston, Mass., May 18, 1949.
5. SCHROEDER, W. C. Synthetic Fuel Production. Presented before the United Nations Scientific Conference on the Conservation and Utilization of Resources, Lake Success, N. Y., Aug. 29, 1949.