

Synthesis

647. SMITH, D. F. Equilibrium Conditions in the Formation of Hydrocarbons and Alcohols from Water Gas. *Ind. Eng. Chem.*, vol. 19, 1927, pp. 801-803.
648. ODELL, W. W. Commercial Possibilities in the Use of Synthetic Hydrocarbon Processes in the Gas Industry. Bureau of Mines Rept. of Investigations 2093, 1928, 15 pp.; *Fuel in Sci. and Practice*, vol. 8, 1929, pp. 178-187.
649. SMITH, D. F. Note Concerning Thermodynamic Calculations. *Ind. Eng. Chem.*, vol. 20, 1928, pp. 859 and 860.
650. SMITH, D. F., DAVIS, J. D., AND REYNOLDS, D. A. Synthesis of Higher Hydrocarbons from Water Gas, I. *Ind. Eng. Chem.*, vol. 20, 1928, pp. 462-464.
651. SMITH, D. F., HAWK, C. O., AND REYNOLDS, D. A. Synthesis of Higher Hydrocarbons from Water Gas, II. *Ind. Eng. Chem.*, vol. 20, 1928, pp. 1341-1348.
652. SMITH, D. F. Abs., Action of Iron Catalysts on Mixtures of Carbon Monoxide and Hydrogen by Audibert and Raineau. *Ind. Eng. Chem.*, vol. 21, 1929, pp. 880-885.
653. SMITH, D. F., HAWK, C. O., AND GOLDEN, P. L. The Mechanism of the Formation of Higher Hydrocarbons from Water Gas. *Jour. Am. Chem. Soc.*, vol. 52, pt. 2, 1930, pp. 3221-3232.
654. KASSEL, L. S. The Possibility of Bimolecular Gas Reactions. *Jour. Am. Chem. Soc.*, vol. 53, June 1931, pp. 2143-2147.
655. SMITH, H. M., RALL, H. T., AND GRANDONE, P. The Production of Motor Fuels from Natural Gas. I. Preliminary Report on Pyrolysis of Methane. Bureau of Mines Rept. of Investigations 3143, 1931, 12 pp.
656. KASSEL, L. S. The Kinetics of Homogeneous Gas Reactions. *Am. Chem. Soc. Monograph*. Published by Chem. Catalog Co., Inc., 419 Fourth Ave., N.Y. Reviewed by O. K. Rice in *Jour. Am. Chem. Soc.*, vol. 54, No. 10, 1932, p. 4121.
657. KESTER, E. B. Pressure Pumps for Circulating Gases in a Closed System. *Ind. Eng. Chem. (Anal. Ed.)*, vol. 4, 1932, p. 298.
658. ATKINSON, R. G., AND STORCH, H. H. Lubricating Oils from Ethylene. *Ind. Eng. Chem.*, vol. 26, 1934, pp. 1120-1122.
659. SMITH, H. M., GRANDONE, P., AND RALL, H. T. Process of Treating Hydrocarbons. U. S. Patent 1,967,269, July 24, 1934.
660. STORCH, H. H. Kinetics of Ethylene Polymerization. *Jour. Am. Chem. Soc.*, vol. 56, 1934, pp. 374-378.
661. SMITH, H. M., GRANDONE, P., AND RALL, H. T. Process for Treating Gaseous Hydrocarbons. U. S. Patent 1,995,330, Mar. 26, 1935.
662. SMITH, H. M., AND RALL, H. T. Process for Treating Gaseous Hydrocarbons. U. S. Patent 1,995,329, Mar. 26, 1935.
663. STORCH, H. H. Activity and Activation Energy in Heterogeneous Catalysis of Gas Reactions. *Jour. Am. Chem. Soc.*, vol. 57, 1935, pp. 1395-1398.

664. STORCH, H. H., AND PINKEL, I. I. Preparation of an Active Cobalt-Copper Catalyst for the Water-Gas Shift Reaction. *Ind. Eng. Chem.*, vol. 29, 1937, p. 715.
665. SMITH, H. M., GRANDONE, P., AND RALL, H. T. Purification of Aromatic Hydrocarbons. U. S. Patent 2,143,036, Jan. 10, 1939.
666. SMITH, H. M. Utilization of Natural Gas for Chemical Products. Bureau of Mines Inf. Circ. 7108, 8 pp.
667. BALL, J. S. Aniline Points of Hydrocarbons. Bureau of Mines Rept. of Investigations 3721, 1943, 49 pp.; *Nat. Petrol. News*, vol. 36, 1944, pp. R297-306.
668. BRINKLEY, R. F., AND BRINKLEY, S. R., JR. Determination of the Size of Submicroscopic Particles by X-Rays. Trans. of article by A. Guinier. *Jour. chim. phys.*, vol. 40, 1943, p. 133; Bureau of Mines Inf. Circ. 7391, 1946, 17 pp.
669. WARNER, B. R. An Improved Pressure-Regulating Device. *Ind. Eng. Chem. (Anal. Ed.)*, vol. 15, 1943, pp. 637 and 638.
670. HOFER, L. J. E. The Preparation and Properties of Metal Carbides with Critical Comment as to Their Significance in the Fischer-Tropsch Synthesis. Bureau of Mines Rept. of Investigations 3770, 1944, 39 pp.
671. SKINNER, K. G., DAMMANN, A. A., SWIFT, R. E., EYERLY, G. B., AND SHUCK, G. R., JR. Diatomites of the Pacific Northwest as Filter Aids. Bureau of Mines Bull. 460, 1944, 87 pp. 25 cents.
672. EMMETT, P. H., AND ANDERSON, R. B. The Adsorption of Water Vapor on Carbon Black. *Jour. Am. Chem. Soc.*, vol. 67, 1945, pp. 1492-1494.
673. HOFER, L. J. E., AND WILG, E. O. Photochemical Investigations, VI. The Photochemical Reaction Between Hydrogen and Iodine Monochloride. *Jour. Am. Chem. Soc.*, vol. 67, 1945, pp. 1441-1444.
674. McCARTNEY, J. T. Determination of the Size Distribution of Fine Coal Particles by the Electron Microscope. Bureau of Mines Rept. of Investigations 3827, 1945, 11 pp.
675. NEUMANN, R., AND SCHROEDER, W. C. Fischer-Tropsch Plant of Hoesch Benzin A. G. at Dortmund, Germany. *Tech. Oil Mission Rept. No. 22; F.I.A.T. Rept. No. 239*, 1945, 3 pp.
676. STORCH, H. H. Synthesis of Hydrocarbons from Water Gas. *Chemistry of Coal Utilization*, (H. H. Lowry, ed.), John Wiley & Sons, Inc., New York, vol. 2, chap. 39, 1945, pp. 1797-1845.
677. ATWELL, H. V., POWELL, H. R., AND STORCH, H. H. Fischer-Tropsch Report No. 1, *Tech. Oil Mission Rept. No. 5*, July 1945, 66 pp.
678. BRINKLEY, S. R., JR. Calculation of Catalyst and Gas Temperature in Adiabatic Contact Catalytic Reactions. *Abs. 110th Meeting, Am. Chem. Soc., Div. Ind. Eng. Chem.*, 1946, p. 42-I.
679. --- Note on the Conditions of Equilibrium for Systems of Many Constituents. *Jour. Chem. Phys.*, vol. 14, 1946, pp. 563, 564, and 686.
680. COLUMBIC, N. Review of Fischer-Tropsch and Related Processes for Synthetic Liquid Fuel Production. Bureau of Mines Inf. Circ. 7366, 1946, 24 pp.

681. HOFER, L. J. E., FEEBLES, W. C., AND DIETER, W. E. X-Ray Diffraction and Magnetic Studies of Unreduced Ferric Oxide Fischer-Tropsch Catalysts. *Jour. Am. Chem. Soc.*, vol. 68, 1946, pp. 1953-1956.
682. ORCHIN, M., AND FELDMAN, J. The Isomerization of Dicyclohexyl. *Jour. Am. Chem. Soc.*, vol. 68, 1946, pp. 2737 and 2738.
683. STORCH, H. H. The Fischer-Tropsch and Related Syntheses. *The Crucible*, vol. 31, 1946, pp. 52, 54, 56, 58, and 60.
684. ANDERSON, R. B., AND EMMETT, P. H. Surface Complexes on Charcoal; Gas Evolution as a Function of Vapor Adsorption and of High-Temperature Evacuation. *Jour. Phys. Colloid Chem.*, vol. 51, 1947, pp. 1308-1329.
685. ANDERSON, R. B., AND HALL, W. K. Surface Areas of Cobalt Fischer-Tropsch Catalysts. *Abs., 111th Meeting, Am. Chem. Soc.*, 1947, p. 2E.
686. ANDERSON, R. B., HALL, W. K., HEWLETT, H. D., AND SELIGMAN, B. Studies of the Fischer-Tropsch Synthesis, II. Properties of Unreduced Cobalt Catalysts. *Jour. Am. Chem. Soc.*, vol. 69, 1947, pp. 3114-3119.
687. ANDERSON, R. B., KRIEG, A., SELIGMAN, B., AND O'NEILL, W. E. Fischer-Tropsch Synthesis, I. Tests of Cobalt Catalysts at Atmospheric Pressure. *Ind. Eng. Chem.*, vol. 39, 1947, pp. 1548-1554.
688. ANDERSON, R. B., MCCARTNEY, J. T., HALL, W. K., AND HOFER, L. J. E. Kieselguhrs; Suitability as Carriers in Catalysts. *Ind. Eng. Chem.*, vol. 39, 1947, pp. 1618-1628.
689. BRINKLEY, S. R., JR. Calculation of the Equilibrium Composition of Systems of Many Constituents. *Jour. Chem. Phys.*, vol. 15, 1947, pp. 107-110.
690. - - - Heat Transfer Between a Fluid and a Porous Solid Generating Heat. *Jour. Applied Phys.*, vol. 18, 1947, pp. 582-585.
691. BRINKLEY, S. R., JR., AND WELLER, S. Generalized Form of the Reaction-Rate Law for Homogeneous Reactions. *Jour. Am. Chem. Soc.*, vol. 69, 1947, pp. 1319-1321.
692. FRIEDEL, R. A., AND MCKINNEY, D. S. The Infrared Absorption Spectra of Liquid and Gaseous Morpholine. *Jour. Am. Chem. Soc.*, vol. 69, 1947, pp. 604-607.
693. FRIEDEL, R. A., AND SHARKEY, A. G., JR. Comparison of Glower and Globar Sources for Infrared Spectrometry. *Rev. Sci. Instruments*, vol. 18, No. 12, 1947, p. 928.
694. HOFER, L. J. E., AND FEEBLES, W. C. Preparation and X-Ray Diffraction Studies of a New Cobalt Carbide. *Jour. Am. Chem. Soc.*, vol. 69, 1947, pp. 893-899.
695. HOFER, L. J. E., AND WELLER, S. The Nature of the Iron Compounds in Red and Yellow Sandstone. *Science*, vol. 106, Nov. 14, 1947, p. 470.
696. LEVA, M. Heat Transfer to Gases Through Packed Tubes. General Correlation for Smooth Spherical Particles. *Ind. Eng. Chem.*, vol. 39, 1947, pp. 857-862.

697. - - - Pressure Drop Through Packed Tubes, Part I. A General Correlation. Chem. Eng. Prog., vol. 43, 1947, pp. 549-554.
698. LEVA, M., AND CROWELL, J. H. Heat Transfer Through Packed Tubes with Chemical Reaction. Abs., 111th Meeting, Am. Chem. Soc., 1947, p. 14-I.
699. LEVA, M., AND GRUMMER, M. Pressure Drop Through Packed Tubes, Part II. Effect of Surface Roughness. Chem. Eng. Prog., vol. 43, 1947, pp. 633-638.
700. - - - - - Pressure Drop Through Packed Tubes, Part III. Prediction of Voids in Packed Tubes. Chem. Eng. Prog., vol. 43, 1947, pp. 713-718.
701. McCARTNEY, J. T., AND ANDERSON, R. B. Crystalline Aggregation of Cobalt Powder. Jour. Applied Phys., vol. 18, 1947, pp. 902 and 903.
702. WELLER, S. Chemisorption of Gases. Jour. Chem. Phys., vol. 15, 1947, p. 336.
703. - - - Kinetics of Carbiding and Hydrocarbon Synthesis with Cobalt Fischer-Tropsch Catalysts. Jour. Am. Chem. Soc., vol. 69, 1947, pp. 2432-2436.
704. ANDERSON, R. B., KRIEG, A., SELIGMAN, B., AND TARN, W. Studies of the Fischer-Tropsch Synthesis, III. Influence of Type of Kieselguhrs on Cobalt Catalysts. Ind. Eng. Chem., vol. 40, No. 12, 1948, pp. 2347-2350.
705. ANDERSON, R. B., HALL, W. K., AND HOFER, L. J. E. Studies of the Fischer-Tropsch Synthesis, IV. Properties of Reduced Cobalt Catalysts. Jour. Am. Chem. Soc., vol. 70, 1948, pp. 2465-2472.
706. FELDMAN, J., MYLES, M., AND ORCHIN, M. Binary Test Mixtures for the Evaluation of Vacuum Rectification Columns. Abs., 113th Meeting, Am. Chem. Soc., April 1948, p. 9N.
707. HAWK, C. O., STERN, N. R., AND HOFER, L. J. E. Catalyst for the Synthesis of Hydrocarbons. U. S. Patent 2,449,071, Oct. 4, 1948.
708. LEVA, M., AND GRUMMER, M. Heat Transfer to Gases Through Packed Tubes. Effect of Particle Characteristics. Ind. Eng. Chem., vol. 40, 1948, pp. 415-419.
709. LEVA, M., GRUMMER, M., WEINTRAUB, M., AND POLLCHIK, M. Fluidization of Solid Non-Vesicular Particles. Chem. Eng. Prog., vol. 44, 1948, pp. 619-626.
710. - - - - - Introduction to Fluidization. Chem. Eng. Prog., vol. 44, No. 7, 1948, pp. 511-520.
711. LEVA, M., GRUMMER, M., WEINTRAUB, M., AND STORCH, H. H. A Study of Fluidization of an Iron Fischer-Tropsch Catalyst. Chem. Eng. Prog., vol. 44, 1948, pp. 707-716.
712. LEVA, M., WEINTRAUB, M., GRUMMER, M., AND CLARK, E. L. Cooling of Gases Through Packed Tubes. Ind. Eng. Chem., vol. 40, 1948, pp. 747-752.
713. MANES, M., AND WELLER, S. Carbon Monoxide Enriched in C<sup>13</sup>. Abs., 113th Meeting, Am. Chem. Soc., April 1948, p. 13-0.

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714. MCKINNEY, D. S., AND FRIEDEL, R. A. A Calibration Method for Infrared Prism Spectrometers. Jour. Optical Soc. America, vol. 38, 1948, pp. 222-225.
715. NEWMAN, L. L. Oxygen in Production of Hydrogen or Synthesis Gas. Ind. Eng. Chem., vol. 40, 1948, pp. 559-582.
716. ORCHIN, M. Work at Israel's Seiff Institute. Chem. Eng. News, vol. 26, No. 40, Oct. 4, 1948, pp. 2956 and 2957.
717. SCHROEDER, W. C. Fischer-Tropsch Alcohol. Symposium on the Future of Alcohol. Chem. Eng. Prog., vol. 44, No. 1, January 1948, pp. 15-17.
718. STORCH, H. H. Foreword to Synthetic Petroleum from the Synthine Process by Weil, B. H., and Lane, J. C., Remsen Press, 1948.
719. - - - A Review of the Development of Processes for Synthesis of Liquid Fuels by Hydrogenation of Carbon Monoxide. Chem. Eng. Prog., vol. 44, No. 6, 1948, pp. 469-480.
720. STORCH, H. H., ANDERSON, R. B., HOFER, L. J. E., HAWK, C. O., AND COLUMBIC, N. Synthetic Liquid Fuels from Hydrogenation of Carbon Monoxide. Bureau of Mines Tech. Paper 709, 1948, 213 pp. 50 cents.
721. WEINTRAUB, M., AND LEVA, M. Pressure Drop in Packed Tubes. A Nomogram. Chem. Eng. Prog., October 1948, vol. 44, pp. 801 and 802.
722. WELLER, S., HOFER, L. J. E., AND ANDERSON, R. B. The Role of Bulk Cobalt Carbide in the Fischer-Tropsch Synthesis. Jour. Am. Chem. Soc., vol. 70, 1948, pp. 799-801.
723. WENDER, I., AND ORCHIN, M. Critical Review of Chemistry of OXO Synthesis for Production of Alcohols from Olefins, Carbon Monoxide, and Hydrogen with Discussion of Reaction Mechanism for OXO and Related Syntheses. Bureau of Mines Rept. of Investigations 4270, 1948, 26 pp.
724. WELLER, S. Effect of Operating Variables Upon the Fischer-Tropsch Synthesis. Bureau of Mines Rept. of Investigations 4405, 1949, 8 pp.

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725. FIELDNER, A. C., BURKE, S. P., ERNST, F. A., BROWN, R. L., AND HUFF, W. J. Utilization of Off-Peak Water-Gas Capacity for Production of Methanol, Ammonia, or Hydrocarbons and Extra Capital Investment Required. Proc. Am. Gas Assoc., 1927, pp. 1027-1036; 1928, pp. 975-979; 1929, pp. 816-822; Am. Gas Jour., vol. 126, 1927, pp. 179-181.
726. BROWN, R. L., AND GALLOWAY, A. E. Methanol from Hydrogen and Carbon Monoxide. Ind. Eng. Chem., vol. 20, 1928, pp. 960-966; vol. 21, 1929, pp. 310-313; vol. 22, 1930, pp. 175 and 176.
727. FIELDNER, A. C., AND BROWN, R. L. Comparative Study of Value Obtained in Synthesis of Methanol. Ind. Eng. Chem., vol. 20, 1928, pp. 1110-1112.

728. STORCH, H. H. Behavior of Zinc Oxide and Zinc Oxide-Chromium Oxide Catalysts in the Decomposition and Synthesis of Methanol. *Jour. Phys. Chem.*, vol. 32, 1928, pp. 1743-1747.
729. SMITH, D. F., AND BRANTING, B. F. The Equilibrium Between Methanol, Carbon Monoxide, and Hydrogen. *Jour. Am. Chem. Soc.*, vol. 51, part 1, 1929, pp. 129-139.
730. STORCH, H. H. An Extension of the Intermediate-Compound Theory of Catalysis in Gas Reactions. *Jour. Phys. Chem.*, vol. 33, 1929, pp. 456-458.
731. LACY, B. S., DUNNING, R. G., AND STORCH, H. H. Equilibrium in the Synthesis and Decomposition of Methanol. *Jour. Am. Chem. Soc.*, vol. 52, 1930, pp. 926-938.
732. SMITH, D. F., AND HIRST, L. L. Reactions That Occur on a Methanol Catalyst. *Ind. Eng. Chem.*, vol. 22, 1930, pp. 1037-1040.
733. - - - - - Reliability of the Heat Data as a Factor in Calculating Equilibria Involving Methanol. *Ind. Eng. Chem.*, vol. 22, 1930, pp. 634 and 635.
734. HIRST, L. L. Methanol Synthesis from Water Gas. *Chemistry of Coal Utilization*, (H. H. Lowry, ed.), John Wiley & Sons, Inc., New York, vol. 2, chap. 40, 1945, pp. 1846-1868.
735. ANDERSON, R. B. Modifications of the Brunauer, Emmett, and Teller Equation. *Jour. Am. Chem. Soc.*, vol. 68, 1946, pp. 686-691.
736. ANDERSON, R. B., AND HALL, W. K. Modifications of the Brunauer, Emmett and Teller Equation, II. *Jour. Am. Chem. Soc.*, vol. 70, 1947, pp. 1727-1734.