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**ORIGINAL**

THE CO - H<sub>2</sub> SYNTHESIS

AT

I. G. FARBEN A. G.

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WASHINGTON, D. C.



OFFICE OF MILITARY GOVERNMENT FOR GERMANY (US)

FIAT FINAL REPORT NO. 1267

14 April 1949

THE CO - H<sub>2</sub> SYNTHESIS AT I. G. FARBEN A. G.

FIRST PART

CO - H<sub>2</sub> SYNTHESIS

BY

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Under the supervision of

DR. W. F. FARAGHER

Ludwigshafen/Rh  
October 1947

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FIELD INFORMATION AGENCY, TECHNICAL

Foreword to  
The CO - H<sub>2</sub> Synthesis

The reports assembled in this publication were compiled by German technicians of the French occupation zone and represent the part played by I. G. Farben A. G. in the field of CO - H<sub>2</sub> synthesis (Volume I). They will supplement the reports on this subject made under the direction of Professor Dr. Friedrich Martin, former president of the Board Ruhrchemie A. G., Oberhausen-Molten-Ruhr, who brought together under his authority technologists of the Ruhrchemie, Lurgi, Brabag, and Rheinpreussen companies.

In addition to the CO - H<sub>2</sub> synthesis studied at Ludwigshafen, there appear in volume II the report of Dr. Winkler on the possibilities for practical application of his gas producer, and in volume III reports on polymerized gasolines.

The initiative for this project belongs to Dr. W. F. Faragher, European Chief of the Synthetic Fuels and Lubricants Section of the American Field Intelligence Agency, Technical who with the cooperation of "Institut du Petrole de Paris" effected a Franco-American cooperation in collecting documents indispensable to the progress of science.

The French team wishes to render him thanks for the energy and understanding he showed in the undertaking and prosecution of this vast project.

Jacques Foucher  
Military Government of the French Zone  
Enseigne de Vaisseau, Administration Branch  
for I. G. Farben A. G. Factories at  
Ludwigshafen-Oppau/Rhine

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October 1947

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II. The oil-circulation process (on the basis of researches by Dr. Franz Duftschmid).

III. The high-pressure gas-circulation process for the synthesis of ethyl alcohol from waste gases (on the basis of researches by Dr. Eduard Linckh and Dr. Richard Klemm).

Appendix: Fused-iron catalysts for CO - H<sub>2</sub> synthesis (report of Dr. Klemm, July 1, 1944).

Low Pressure Division, Oppau  
Gasification Experiments Section  
Dr. Fritz Winkler

Oppau, May 30, 1947.

Introduction to

Part I    CO - H<sub>2</sub> Experiments

Research was conducted at the Badische Anilin- und Soda- Fabrik by Dr. Mittasch and Dr. Pier on the conversion of CO - H<sub>2</sub> to methanol (1921-1922) and by Dr. Karl Hochschwender on the conversion to isobutyl alcohol (1924-1925). Experiments on the production of hydrocarbons only from CO - H<sub>2</sub>, and in particular, of C<sub>2</sub>H<sub>4</sub>, C<sub>3</sub>H<sub>6</sub>, and C<sub>4</sub>H<sub>8</sub> from CO - H<sub>2</sub> were started in January 1926 at the instance of Dr. Fritz Winkler by his collaborator Dr. Eduard Linckh. A slight conversion of CO - H<sub>2</sub> to C<sub>2</sub>H<sub>4</sub> etc. was found to occur with copper catalysts at ordinary pressure and at 100° C. On April 1, 1926 Franz Fischer published (for the first time) an article in the Zeitschrift für Brennstoffchemie on the production of oils etc. from CO - H<sub>2</sub> at ordinary pressure with iron and cobalt catalysts. Furthermore, Linckh discovered that silver, gold, and zinc catalysts act like copper catalysts (French patent 635950, English patent 293185), but that the yields were very small. In the fall of 1926 he turned to the preparation of oils etc. from CO - H<sub>2</sub> under pressure with fused iron-oxide catalysts. Linckh investigated more than 1000 catalysts, all in the gas phase under a pressure of 100-200 atmospheres. Special arrangements of the catalyst in the reactor were tested for the purpose of conducting away the large quantities of heat evolved during the conversion of CO - H<sub>2</sub> to oils.



It was extraordinarily difficult, however, to avoid soot formation on the catalyst in the gas phase under pressure. The solution of this problem was arrived at by Duftschmid: conversion of CO - H<sub>2</sub> with Linckh's catalyst in its own oil.

Dr. Klemm conducted experiments on the preparation of ethyl alcohol from CO - H<sub>2</sub> under 200 atmospheres pressure in the gas phase. He was able to avoid the deposition of carbon on the Linckh catalyst by copper plating a part of the catalyst, by arrangement of the catalyst in a thin bed at the tube wall (the reactor consisted of a bundle of tubes); and by using large quantities of circulating gas.

Dr. Fritz Winkler