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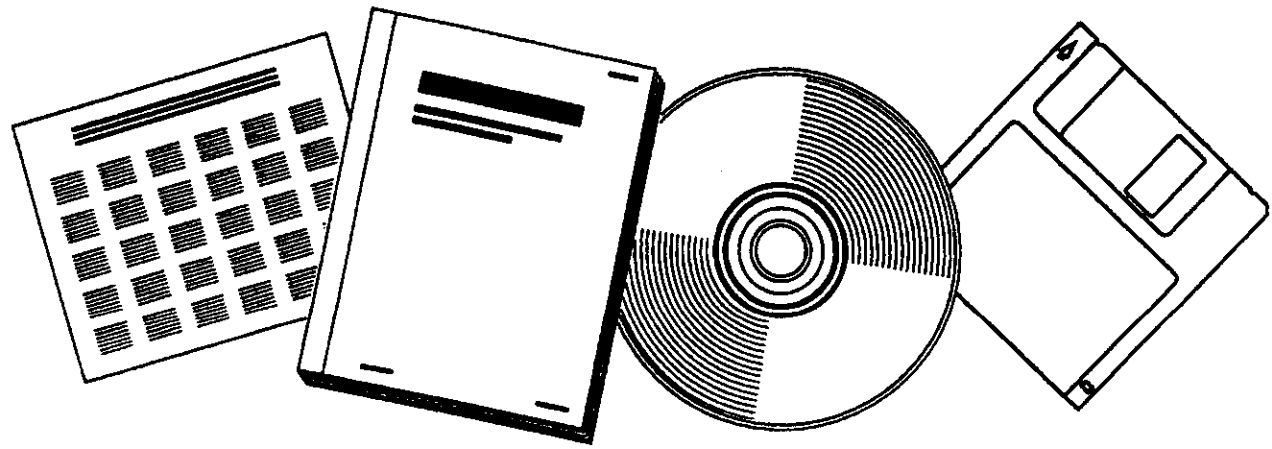
A RESEARCH AND DEVELOPMENT PROGRAM FOR CATALYSIS IN COAL CONVERSION PROCESSES

LIBBY (W. F.) LABS., LOS ANGELES, CALIF

MAY 1974



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Final Report

A RESEARCH AND DEVELOPMENT PROGRAM FOR CATALYSIS IN COAL CONVERSION PROCESSES

Final Report

By

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Prepared Under Research Project EPRI 207-0-0

by

W F LIBBY LABORATORIES
LOS ANGELES, CALIFORNIA

For

ELECTRIC POWER RESEARCH INSTITUTE
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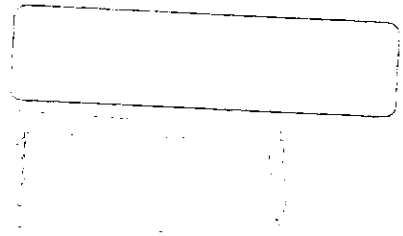
ABSTRACT

The use of catalysts in coal conversion processes is reviewed and a research and development program is recommended for catalysis in future coal conversion technology. Emphasis is on those processes leading to clean fuels for electric power generation. A literature survey containing abstracts of more than 400 relevant publications is included.



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PREFACE

George R. Hill
Electric Power Research Institute

The rapidly increasing need for clean energy production from coal-derived fuels has placed great urgency on the advancement of technology in coal conversion catalysis. Because of this, the Electric Power Research Institute (EPRI) commissioned the W F Libby Laboratories to conduct a comprehensive literature search and bring together experts in the field to assess the state-of-the-art in coal catalysis.

Conferences and individual studies were conducted to determine specific areas offering greatest potential for advances in catalysis. This has resulted in the recommendation of a "Coal Catalysis Research and Development Program," to utilize advances made by the petroleum and chemical industries in studying depolymerization, hydrogenation, and molecular restructuring of coal. It suggests that major advances are possible in increasing the efficiency and specificity of catalysts for coal conversion processes as the research recommended in this report moves forward.

This document reports the findings and recommendations of the Libby Laboratories on coal catalysis.

1. Project History

In late summer of 1973, the Electric Power Research Institute commissioned W F Libby Laboratories to devise a research and development program for the use of catalysts in the processing of coal to produce fuels for electric power generation.

In pursuit of this objective, a conference was convened on 24 and 25 September 1973 in Santa Monica, California, at which a research and development program for coal catalysis was suggested. In the following seven months, this program was studied and considered in depth by various Task Forces, and this report contains the substance of these efforts. The Task Force reports, in their entirety, are printed in Appendix A.

A report on the conference, "Proceedings of the EPRI Conference on Coal Catalysis," was issued in October, 1973, and copies are available on request from W F Libby Laboratories, 10921 Wilshire Boulevard, LL4, Los Angeles, California, 90024.

2. Research and Development Program

I. Catalysts for Gasification and Liquefaction:

A. Catalysts for Hydrodesulfurization and Liquefaction of Coal.

To improve on the present Co/Mo sulfide-supported catalysts used in the Synthoil process.

B. Catalysts for Low-Sulfur Producer Gas for Power Stations.

C. Catalytic Properties of Coals and Beneficial Modifications by Additives.

1. Catalytic properties of ashes

2. Catalytic properties of coal

3. Effects of additives

a. Limestone

b. Alkali carbonates

c. Active ashes

II. Fischer-Tropsch Catalysts to Produce Jet Fuel and Methanol for Peaking Power:

Attempt to improve on the present state-of-the-art seeking higher space velocity and durability against sintering and poisoning by sulfur and carbon deposition.

III. Lewis Acid ($ZnCl_2$) Catalytic Liquefaction:

A. Supporting work on the mechanism of the dissolving of the coal.

B. The nature and mechanism of the hydrogenolysis catalytic activity.

IV. Supporting Research:

A. Mechanism of Bond Breaking in Coal Catalysis; Center-Ring Cracking of Polynuclear Aromatic Structures.

IV. Supporting Research (cont'd):

B. New Catalyst Materials

High-temperature transition element sulfide, carbides, nitrides, oxides, borides, etc., as candidate catalysts for coal gasification and liquefaction preparation and testing.