

FINAL REPORT

Investigations of Reactor Performance,
Role of Inherent Catalysts, Hydrogen Donor Solvents and
PCT Properties of Coal Liquids and Slurries

by

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INTRODUCTION

The direct liquefaction of coal to produce liquid fuels is one of the alternatives to liquids from petroleum. After the oil embargoes and shortages during the 1970's there was strong interest in direct coal liquefaction, resulting in research and development programs, pilot plants, and demonstration plants sponsored by the Department of Energy in cooperation with private industry. Much useful information for coal liquefaction was obtained, and it is important that this information be properly evaluated and interpreted, especially since many of the programs have terminated. This document is the final report for a project sponsored by the Department of Energy which has as its primary objectives the critical examination of the data which have been obtained and a summary and assessment of the state of direct coal liquefaction as used in SRC-II and related processes in three specific areas:

- 1) Reaction kinetics and reactor performance in direct coal liquefaction.
- 2) Role of inherent catalysts and hydrogen donor solvents in direct coal liquefaction.
- 3) Physical, chemical, and thermodynamic properties of coal liquids and slurries.

Although attention has been focussed on the SRC-II process, many of the conclusions are applicable to other processes. The primary sources of data were the Liquefaction Technology Data Base (LTDB) which has been established at the Pittsburgh Energy Technology Center, and the published literature. The

LTDB is a primary repository of coal liquefaction data obtained in projects sponsored by the Department of Energy. It contains reports, data, and other information relevant to coal liquefaction. In the course of preparing the reports presented in the following pages important documents were abstracted. More than 100 new abstracts were added to the data base.

The work was done by faculty members and postdoctoral students of the Department of Chemical and Petroleum Engineering at the University of Pittsburgh over the period October 1, 1982 to September 30, 1983. Alan Brainard, Yatish Shah, John Tierney, and Irving Wender are the faculty members who worked on the project. The postdoctoral students were Rajendra Albal, Sanjay Godbole, Balmohan Kelkar, and Amol Kulkarni. Additional help was provided by William Devine, a baccalaureate student in the department.

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REACTION KINETICS AND REACTOR PERFORMANCE
IN DIRECT COAL LIQUEFACTION

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