Coal Liquefaction and Gasification Technologies

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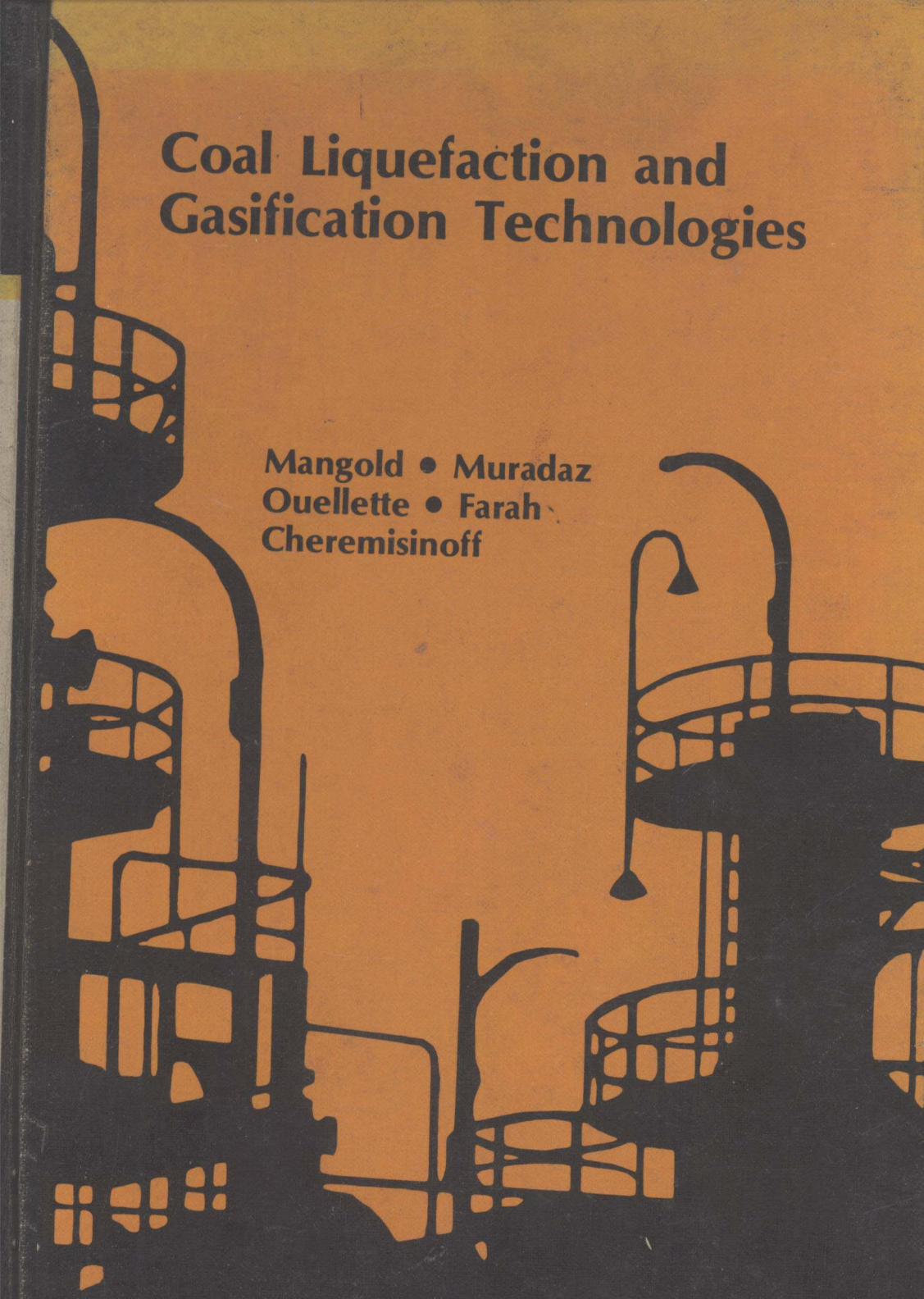

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PREFACE

During the past decade large increases in petroleum prices have had profound effects on the economies of the world. An outgrowth has been evaluations on contributions that can be made by new technologies utilizing coal to energy programs. This book resulted from a study by the Metrek Division of the MITRE Corporation, sponsored by the French national utility, Electricité de France, to explore opportunities for: (1) technologies for coal utilization being developed, and (2) basic research and development on coal utilization technologies.

This study reviews the state-of-the-art of selected liquefaction and gasification processes that have been developed with support from the United States. Information in this study was obtained from sources in the public domain, with contractor project reports to the U.S. Department of Energy as a major source. Conference papers and technical journal articles on process development were another major source often used. These documented sources were supplemented by conversations with personnel from the companies that are the process developers. Much of the information that is crucial to the technical development of the processes is proprietary and not obtainable by the general public.

The processes contained in this review are:

1. liquefaction—Exxon Donor Solvent, H-Coal, Solvent-Refined Coal I and II, Mobile Gasoline Synthesis, Fischer-Tropsch Synthesis and Zinc Halide Hydrocracking; and
2. gasification—Slagging Lurgi, Texaco, Combustion Engineering, COGAS and Shell-Koppers.

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Robert P. Ouellette
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MANGOLD

MURADAZ

OUELLETTE

Edward C. Mangold holds a PhD in physics from Oklahoma State University. He spent four years with the U.S. Environmental Protection Agency Enforcement Division performing field studies at several power plants and industrial facilities, where new instruments and measurement methods were investigated for use in operational field measurements of pollution. For the last three years at the MITRE Corporation, Dr. Mangold has worked to improve the management control systems used by the Department of Energy for environmental and safety problems in nuclear, petroleum and fossil energy technologies. A state-of-the-art assessment of coal-based technologies was performed for gasification, liquefaction, fluidized-bed combustion and combined-cycle power plants.

Mario A. Muradaz is a Research Associate with the Metrek Division of the MITRE Corporation. For the past three years he has worked in Technology Programs, assessing the technical and economic merits of new industrial processes and technologies for Electricité de France. Mr. Muradaz has an extensive background in chemical engineering and holds a degree in economics from the University of Maryland.

Robert P. Ouellette is Technical Director of the Environment Division of the MITRE Corporation. Dr. Ouellette has been associated with MITRE in varying capacities since 1969 and had been Associate Technical Director since 1974. Earlier, he was with TRW Systems, Hazelton Labs, Inc. and Massachusetts General Hospital. He graduated from the University of Montreal and received his PhD from the University of Ottawa. A member of the American Statistical Association, Biometrics

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Society, Atomic Industrial Forum and the National Science Foundation Technical Advisory Panel on Hazardous Substances, Dr. Ouellette has published numerous technical papers and books on energy and the environment. He is co-author of the comprehensive *Electrotechnology* survey series published by Ann Arbor Science.

Oscar G. Farah is Manager of International Programs, Energy Resources and the Environment Division at Metrek, a division of the MITRE Corporation. Before joining MITRE, he was a research scientist at the Naval Research Laboratories and the Carlisle Barton Laboratory of Johns Hopkins University, and was a member of the technical staff at Bell Telephone Laboratories and the Western Electric Company. Dr. Farah obtained a BS in mechanical engineering from Purdue University and a PhD in electrical engineering from Johns Hopkins University. He has published a number of papers on world energy demand and supply, transmission, and conservation, and is co-author of *Ethylene: Basic Chemicals Feedstock Material,* published by Ann Arbor Science.

Paul N. Cheremisinoff is Associate Professor of Environmental Engineering at the New Jersey Institute of Technology. He is a consulting engineer and has been a consultant on environment/energy/resources projects for the MITRE Corporation. A recognized authority on pollution control and alternative energy technologies, he is author/editor of many publications, including several Ann Arbor Science handbooks on pollution and energy, such as *Pollution Engineering Practice Handbook, Carbon Adsorption Handbook, Environmental Impact Data Book, Industrial and Hazardous Wastes Impoundment,* and *Environmental Assessment & Impact Statement Handbook.*

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