Materials of Construction for Advanced Coal Conversion Systems

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Materials of Construction for Advanced Coal Conversion Systems

by

Vinod K. Nangia

The Engineering Societies Commission on Energy, Inc.
(ESCOE)

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The Engineering Societies Commission on Energy, Inc. (ESCOE) is a nonprofit corporation established by the five Founder Engineering Societies to provide independent, objective technical and economic assessments to the Department of Energy (DOE). The professional staff in ESCOE consists of Engineers in Residence who are on loan from their employers for approximately two years. Each Engineer in Residence has an outstanding record of experience and achievement related to fossil energy technology.

Foreword

This book, based on studies by Vinod K. Nangia, *The Engineering Societies Commission on Energy, Inc.* (ESCOE), describes materials of construction and materials problems for equipment used in advanced coal conversion systems. The need for cost effective industrial operation is always a prime concern, particularly in this age of energy consciousness. Industry is continually seeking improved materials for more efficient systems. The information presented here is intended to be of use in the design and planning of these systems.

Coal conversion and utilization impose severe demands on construction materials because of high temperature, high pressure, corrosive/erosive, and other hostile environmental factors. Successful economic development of these processes can be achieved only to the extent that working materials can withstand increasingly more aggressive operating conditions.

The book, which reviews present and past work on the behavior of materials in the environments of advanced coal conversion systems, is divided into three parts: atmospheric fluidized bed combustion, coal gasification and liquefaction, and advanced power systems. Advanced power systems include an integrated coal gasifier-molten carbonate fuel cell power plant with a steam turbine/gas turbine bottoming cycle, and a combined cycle power plant using a pressurized fluidized bed coal combustor.

Each part documents data of interest to designers, engineers, metallurgists, etc; identifies materials problem areas; and defines operating conditions in terms of temperature, pressure, and corrosive/erosive environments. Each part also proposes candidate materials of construction based on extrapolation of available data and related experience from other technologies, such as petroleum refining. Finally, areas needing further research and development are set forth.

The information in the book is from the following documents:

Materials for Coal Conversion and Use. Volume I–Materials of Construction for Atmospheric Fluidized Bed Coal Combustion (FE-2468-43),

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by Vinod K. Nangia, The Engineering Societies Commission on Energy, Inc. (ESCOE), prepared for the U.S. Department of Energy, February 1979.

Materials for Coal Conversion and Use. Volume II–Materials of Construction for Coal Conversion Systems. Part I–Coal Gasification, Part II –Coal Liquefaction (FE-2468-59), by Vinod K. Nangia, The Engineering Societies Commission on Energy, Inc. (ESCOE), prepared for the U.S. Department of Energy, October 1979.

Materials for Coal Conversion and Use. Volume III–Materials of Construction for Advanced Power Systems (FE-2468-71), by Vinod K. Nangia, The Engineering Societies Commission on Energy, Inc. (ESCOE), prepared for the U.S. Department of Energy, August 1980.

The table of contents is organized in such a way as to serve as a subject index and provides easy access to the information contained in the book.

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PART III: ADVANCED POWER SYSTEMS

Part I

Atmospheric Fluidized Bed Combustion

The information in Part I is from *Materials for Coal Conversion and Use. Volume I — Materials of Construction for Atmospheric Fluidized Bed Coal Combustion* (FE-2468-43), by Vinod K. Nangia, The Engineering Societies Commission on Energy, Inc. (ESCOE), prepared for the U.S. Department of Energy, February 1979.

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