

# **ADVANCED CERAMIC MATERIALS**

## **Technological and Economic Assessment**

**Based on studies by**

**Charles River Associates Incorporated**

**International Trade Administration**

**National Materials Advisory Board**

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**Charles River Associates Incorporated**  
Boston, Massachusetts

**International Trade Administration**  
U.S. Department of Commerce  
Washington, DC

**National Materials Advisory Board**  
National Research Council  
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## Foreword

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This book is an assessment of the current competitive status of advanced ceramic materials, presenting the situation both from the technological aspect and the economic viewpoint. U.S. prospects relative to Japanese technology and the Japanese governmental philosophy, as well as the general international picture, are outlined and discussed. Five specific applications of advanced ceramic materials—heat engines, capacitors, integrated optic devices, gas sensors, and cutting tools—are covered at length.

Advanced ceramic materials are a relatively new class of high-performance materials with significant potential for future economic impact. Advanced ceramics are differentiated from traditional ceramics by the specialized properties they possess as well as by the sophisticated processing they require. Because of these special properties, advanced ceramic materials are expected to be used increasingly in a number of high-performance commercial applications ranging from heat- and wear-resistant parts to electronic and optical devices.

Currently, U.S. shipments and consumption of advanced ceramic parts are in the range of \$1 to \$2 billion per year. These are expected to grow rapidly for the remainder of the twentieth century due both to the development of new applications and to the substitution of ceramic products for alternative products in existing as well as new applications. These new applications and the increased substitution for alternative technologies, in turn, will result from expected technological improvements in advanced ceramics. U.S. shipments and consumption of advanced ceramic products are projected to reach approximately \$10 billion by the end of the century.

The information in the book is from the following sources:

*Technological and Economic Assessment of Advanced Ceramic Materials, Volume 1: Summary and Conclusions, Volume 2: A Case*

*Study of Ceramics in Heat Engine Applications, Volume 3: A Case Study of Ceramic Capacitors, Volume 4: A Case Study of Integrated Optic Devices, Volume 5: A Case Study of Ceramic Toxic and Combustible Gas Sensors, and Volume 6: A Case Study of Ceramic Cutting Tools* prepared by Charles River Associates Incorporated for the National Bureau of Standards, U.S. Department of Commerce, August 1984.

*A Competitive Assessment of the U.S. Advanced Ceramics Industry* prepared by the Office of Industry Assessment, Trade Information and Analysis, Assistant Secretary for Trade Development, International Trade Administration of the U.S. Department of Commerce, March 1984.

*High Technology Ceramics in Japan* prepared by the Committee on the Status of High-Technology Ceramics in Japan for the National Materials Advisory Board, Commission on Engineering and Technical Systems, National Research Council, 1984.

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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