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**APPLICATION RELATED
PHENOMENON IN
ZIRCONIUM
AND ITS ALLOYS**

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STP 458

AMERICAN SOCIETY FOR TESTING AND MATERIALS

APPLICATIONS-RELATED PHENOMENA IN ZIRCONIUM AND ITS ALLOYS

A symposium
sponsored by the
AMERICAN SOCIETY FOR
TESTING AND MATERIALS
Philadelphia, Pa., 5-7 November, 1968

ASTM SPECIAL TECHNICAL PUBLICATION 458

List price \$27.25

AMERICAN SOCIETY FOR TESTING AND MATERIALS
1916 Race Street, Philadelphia, Pa. 19103

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Library of Congress Catalog Card Number: 76-79164
SBN 8031-0021-3

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Foreword

The Symposium on Applications-Related Phenomena in Zirconium and Its Alloys was presented in Philadelphia, Pa., 5-7 November, 1968. Committee B-10 on Reactive and Refractory Metals and Alloys sponsored the symposium. E. F. Baroch, Wah Chang Albany Corp., was symposium chairman; and the editorial committee consisted of W. R. Thomas, Atomic Energy of Canada, Ltd., S. S. Christopher, Combustion Engineering Nuclear Department, and P. L. Rittenhouse, Oak Ridge National Laboratory.

Related ASTM Publications

Flow and Fracture Behavior of Metals and Alloys in
Nuclear Environment, STP 380 (1965), \$24.00

Symposium on the Chemical and Physical Effects of
High-Energy Radiation on Inorganic Sub-
stances, STP 400 (1966), \$5.25

Fifty Years of Progress in Metallography Techniques,
STP 430 (1968), \$25.75

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Introduction

During the past few years, the conversion from fossil-fueled to nuclear-powered electrical power-generating stations has been so rapid that even the most optimistic forecast of a few years ago has been far exceeded. Nearly all utilities, public and private, have a commitment to nuclear power, many of them as individual owners and many more as partners in nuclear generation enterprises. At least one large, electric-power consumer is considering installation of a nuclear reactor to supply power exclusively for internal requirements.

Paralleling this development has been the growth of the use of zirconium as a cladding for the uranium fuel elements which are the heart of a reactor. The zirconium industry was born from the need for dependable cladding material in the nuclear propulsion of submarine and surface vessels for the U.S. Navy. In the early commercial land-based reactors, zirconium was felt to be an unnecessary luxury. However, the need for improved fuel utilization became crucial in the over-all economics of electrical power generation, and zirconium proved itself to be worth the initial cost premium. Inadequate long-term performance of stainless steels made the choice obvious.

Several years of generally satisfactory performance have now been realized by zirconium and current interest centers on development of still-improved properties.

This symposium, sponsored by ASTM Committee B-10 on Reactive and Refractory Metals, was held in Philadelphia, on 5-7 November, 1968. Emphasis was on the engineering aspects relative to improved fuel performance in which zirconium alloys served as the cladding. Technical areas ranged from anisotropy control, through thermal excursion performance, alloy development, stress relaxation, and corrosion performance. Papers from the U.S. and five foreign countries were presented.

E. F. Baroch

Director, Metallurgical Research & Development,
Wah Chang Albany Corp., Albany, Ore.;
symposium general chairman

