

SYMPOSIUM ON RADIATION EFFECTS IN REFRACTORY FUEL COMPOUNDS

INTRODUCTION

BY JOHN E. GATES¹

In discharging its responsibilities to promote the investigation of changes in the properties and constitution of materials as a function of radiation exposure, ASTM Committee E-10 on Radioisotopes and Radiation Effects has sponsored several symposia over the past few years. The subject of these symposia has been generally radiation effects in materials. The present symposium was organized along similar lines, although an attempt was made to place more emphasis upon the theoretical aspects of radiation effects wherever possible and to discuss one class of materials in greater depth.

The subject of the present symposium, "Radiation Effects in Refractory Fuel Compounds," was chosen because of current interest in reactor designs requiring fuels that will operate at high temperatures for long periods of time. Since UO_2 offers considerable promise as a high-temperature fuel and since it has been studied in more detail than any other fuel, it is only natural that the bulk of the papers presented in the symposium concern this fuel material. Other materials with excellent potential as high-temperature fuels such as UC, PuO_2 , and UO_2 dispersions in BeO and Al_2O_3 matrices, are also discussed.

In the case of UO_2 , specific subjects discussed in detail include the effects of excess oxygen on irradiation performance, factors affecting formation of voids, and the release of fission gases both during and after irradiation. A description of basic studies of the characteristics of fission fragment tracks in UO_2 is given. Irradiation effects in UC, effects of burnup of UO_2 dispersions in BeO and Al_2O_3 , and the irradiation behavior of PuO_2 fast breeder fuels are discussed in detail. The effects of radiation on sintering characteristics and hydrolysis of BeO are described to give more insight into the fundamentals of radiation effects on materials.

One of the high lights of the symposium was a round-table discussion of radiation effects by well-known researchers in this field. Included in this discussion were J. A. L. Robertson, J. A. Brinkman, T. S. Noggle, E. A. Aitken, M. L. Bleiberg, and J. L. Bates, with M. J. Whitman as moderator. The discussions were directed toward radiation effects in refractory fuel compounds and provided many interesting observations on the current state of the art. In addition, some studies were described that have not as yet been formally reported.

It is hoped that the efforts of the Symposium Committee, which included J. B. Trice and Roger Sutton, has resulted in a useful and informative program.

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