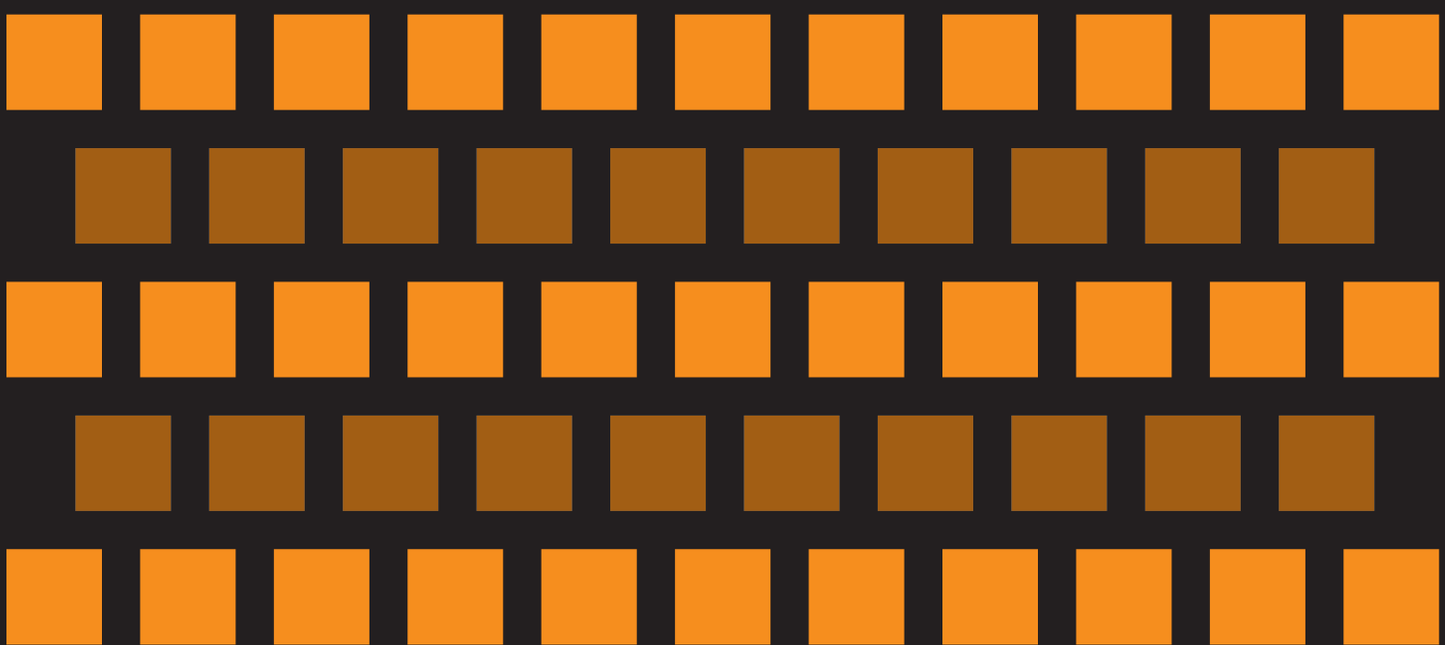
STP-NU-009

GRAPHITE FOR HIGH TEMPERATURE GAS-COOLED NUCLEAR REACTORS



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FOREWORD

This report is intended as an introduction to the burgeoning field of graphite high temperature gas-cooled nuclear reactors with particular emphasis on nuclear graphite.

There is a brief review of the use of bulk graphite as a moderator in fission reactors around the world from the beginnings in 1942 to Generation IV prismatic and pebble bed High Temperature Reactor (HTR) potential. The characteristics, manufacture, properties and irradiation behavior of bulk graphites are outlined. A bibliography is provided for further study.

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ABSTRACT

This technical report presents the basic information relative bulk graphite production, structure, chemical properties, physical properties and neutron irradiation behavior. Bulk graphite characteristics, its manufacture, properties and irradiation behavior as well as a new generation of nuclear grades are briefly reviewed. An overview of graphite moderated gas-cooled reactor designs is also presented. The report serves as a summary of the training seminar on Nuclear Graphite conducted during the ASME Boiler and Pressure Vessel Code week, October 30–November 3, 2006, in Louisville, KY.

There is no universally accepted code for the design of graphite moderator structures. The history of graphite moderated reactors is traced from the beginnings in 1942 to the most recent utility start-up in 1989. Developments have continued over the intervening years especially in the area of helium cooled High Temperature Reactors. Prismatic 30MWth, and pebble-bed 10MWth, test reactors were brought into operation in Japan and China, respectively.