Contribution ID: **546** Type: **Overview Presentation**

OV/5-4: Multimodal Options for Materials Research to Advance the Basis for Fusion Energy in the ITER Era

Wednesday 10 October 2012 09:45 (25 minutes)

Sustained worldwide efforts on fusion energy research have led to substantial improvements in understanding of plasma physics and fusion technology issues. Several options with varying degrees of technological risk are being contemplated for the next major fusion energy device that will be constructed after ITER begins operation. These options include a variety of plasma confinement configurations, coolants, tritium breeding materials, power conversion systems, and operating temperatures. In many cases, variations in the aggressiveness of the design parameters for next-step devices are associated with uncertainties in the performance of the materials systems to be used in the divertor, first wall and breeding blanket, and tritium extraction and power conversion systems. In order to reduce some of these uncertainties and to assist in the selection of the most appropriate design concept(s) that meet national needs, well-coordinated international fusion materials research on multiple fundamental feasibility issues can serve an important role during the next ten years.
There are two inter-related overarching objectives of fusion materials research to be performed in the next decade: 1) understanding materials science phenomena in the demanding DT fusion energy environment, and 2) Using this improved understanding to develop and qualify materials to provide the basis for next-step facility construction authorization by funding agencies and public safety licensing authorities. There are several important fundamental materials questions that should be resolved soon due to their potential major impact on next-step fusion reactor designs, including radiation effects on mechanical properties, structural stability and tritium permeation and trapping. An overview will be given of the current state-of-the-art of major materials systems that are candidates for next-step fusion reactors, including a summary of existing knowledge regarding operating temperature and neutron irradiation fluence limits due to high temperature strength and radiation damage considerations, coolant compatibility information, and current industrial manufacturing capabilities. The critical issues and prospects for development of high performance fusion materials will be discussed along with recent research results and planned activities of the international materials research community.

Country or International Organization of Primary Author

USA

Collaboration (if applicable, e.g., International Tokamak Physics Activities)

IEA fusion materials Annex II

Author: Mr ZINKLE, Steven (USA)

Co-authors: Dr MÖSLANG, Anton (Karlsruhe Institute of Technology); Dr TANIGAWA, Hiroyasu (Japan Atomic Energy Agency); Prof. MUROGA, Takeo (National Institute for Fusion Science)

Presenter: Mr ZINKLE, Steven (USA)

Session Classification: Overview

Track Classification: OV - Overviews