

## ITER Test Blanket Module Functional and Advanced Materials\*

C.P.C. Wong<sup>1</sup>, V. Chernov<sup>2</sup>, A. Kimura<sup>3</sup>, R. Kurtz<sup>4</sup>, N. Morley<sup>5</sup>,  
T. Muroga<sup>6</sup>, K. W. Song<sup>7</sup>, Z. Y. Xu<sup>8</sup>, M. Zmitko<sup>9</sup>

<sup>1</sup>*General Atomics, San Diego, California*

<sup>2</sup>*Bochvar Institute, Moscow, Russia*

<sup>3</sup>*Institute of Advanced Energy, Kyoto University, Kyoto, Japan*

<sup>4</sup>*Pacific Northwest Laboratory, Richland, Washington*

<sup>5</sup>*University of California Los Angeles, Los Angeles, California*

<sup>6</sup>*National Institute for Fusion Science, Orushi, Japan*

<sup>7</sup>*Korea Atomic Energy Research Institute, Yuseong, Korea*

<sup>8</sup>*Southwestern Institute of Physics, Chengdu, China*

<sup>9</sup>*EFDA, Close Support Unit, Garching, Germany*

Solid breeder and liquid breeder blanket concepts are being developed to be tested in ITER. In addition to the use of reduced activation ferritic/ferritic-martensitic steels (RAFS) as the structural material, there are two classes of functional and advanced materials being considered. In the class of functional materials, SiC<sub>f</sub>/SiC composite with low thermal conductivity is proposed as the flow channel insert (FCI) to perform the functions of MHD and thermal insulation for the dual-coolant Pb-17Li concept. Er<sub>2</sub>O<sub>3</sub> and Y<sub>2</sub>O<sub>3</sub> coatings and metallic sandwiched inserts are proposed as mandatory MHD insulation options for the self-cooled Li breeder concept. In the class of advanced materials for possible use in the longer term beyond ITER, SiC<sub>f</sub>/SiC composite with high thermal conductivity has been proposed as a high performance low activation structural material. When used with the Pb-17Li breeder self-cooled design and in the dual coolant approach, high thermal performance of > 44% can be projected. For the choice of structural material, replacement of conventional RAFS steels by a suitable ODS alloy would allow for an increased allowable operating temperature of 650°C (ferritic-martensitic ODS steels) or even above 700°C (nanocomposite ferritic steels). These temperatures are 100°C and 150°C higher, respectively, than for today's RAFS alloys. Application of these functional and advanced materials to respective blanket concepts will be described in this paper. At the same time required properties, development status, and development requirements will also be presented.

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