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Status and Strategy of CLAM Steel for Fusion Application in China

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A program for fusion reactor structural material, i.e. the China Low Activation Martensitic (CLAM) program, aims to satisfy the material requirements for test blanket module (TBM) for ITER, China fusion engineering test reactor (CFETR) and fusion demonstration reactor (C-DEMO) in China. It has been undertaken by INEST (Institute of Nuclear Energy Safety Technology), CAS (Chinese Academy of Science) since 2001 under support from the Ministry of Science and Technology of China etc. and with wide domestic and overseas collaborations. The status and strategy of the CLAM steel project are reviewed in this presentation.

CLAM steel has been chosen as the primary structural material for the Chinese helium cooled ceramic breeder (CN HCCB) TBM for ITER. Much progress of the CLAM project has been achieved with the efforts in the past fifteen years, including large scale fabrications, various physical and mechanical property tests, series of neutron irradiation experiments up to 21dpa, long-term corrosion experiments in flowing liquid PbLi up to 20,000hrs, different scaled TBM mockup fabrications, development and establishment of material database, etc..

To license a pressurized nuclear equipment, e.g. the ITER TBM and the blanket for DEMO, it needs to present the design and safety analyses with sufficient data such as the consolidated materials data, design limits and qualified fabrication procedures specifications etc. to the Regulator (ESP/ESPN) and the Agreed Notified Body (ANB) of France or Nuclear Safety Agency of China. A lot of efforts and work are being devoted to the R&D of CLAM steel to its final successful application in the fusion systems. Its properties database got basically meets the requirement of the qualification for ITER-TBM.

Keywords: CLAM steel; TBM; Fusion; Nuclear engineering licensing

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