conferenceseries.com

Takumi Chikada, J Phys Chem Biophys 2017, 7:3 (Suppl)
DOI: 10.4172/2161-0398-C1-022

2nd International Conference on
PHYSICS
August 28-30, 2017 Brussels, Belgium

Takumi Chikada

Shizuoka University, Japan

Tritium permeation mechanism in fusion reactor fuel systems

One of the critical issues in the fusion reactor fuel system is tritium permeation through structural materials. Tritium permeates fast through metal walls at elevated temperature, resulting in a crucial fuel loss and radiological hazard for the environment. Moreover, hydrogen dissolves in most metals with forming metal hydrides, leading to a degradation of mechanical properties of metal structural materials, as it is called hydrogen embrittlement. A promising solution to reduce tritium permeation to an acceptable level is to coat a thin film as a tritium permeation barrier (TPB). TPBs have been studied using ceramic coatings over several decades in the fusion reactor engineering research field. However, no appropriate coating materials or fabrication methods for practical applications have been determined. Our efforts have been dedicated to investigating hydrogen isotope permeation behaviors in TPBs using mainly metal oxide coatings for a decade. The hydrogen isotope permeation mechanism was elucidated, leading to the world's highest permeation reduction factor at elevated temperatures. The development of coating process toward plant-scale fabrication has also progressed using liquid phase methods. A multilayer structure has been recently investigated to make TPBs which have multiple functions: adhesion to structural materials in a wide operational temperature range, compatibility with corrosive materials, etc. Irradiation effects on tritium permeation in TPBs have been also studied using heavy-ions and a γ-ray source. In this presentation, achievements and current challenges for the research and development of TPBs are introduced.

Biography

Takumi Chikada has completed his PhD in Engineering from The University of Tokyo, Japan in 2011, and soon started working as an Assistant Professor. He has been working at Shizuoka University as a Lecturer since 2014. His expertise is fusion reactor engineering, especially hydrogen isotope migration in materials. He has published more than 40 papers in reputed journals.

chikada.takumi@shizuoka.ac.jp

Notes: