HYDROGENIC SPECIES TRANSPORT ASSESSMENTSIN CERAMIC INSULATORS USED IN ITER ICRH H&CD SYSTEMS

L. A. Sedano, K. J. McCarthy and E. R. Hodgson
EURATOM-CIEMAT Fusion Association
P.O. Box: Bd. 43 P0.04, Avda. Complutense 22, E-28040 Madrid (Spain)

Optoelectronic properties of insulators used as H&CD and Diagnostic vacuum windows/feedthroughs in ITER come modified by a surface intake and bulk transport of hydrogenic (H') species. Such vacuum windows, operating under severe radiation doses, have a primary safety role as tritium confinement barriers.

Ionizing radiation can potentially enhance the (H') uptake/release at window surfaces and the diffusion rates through its bulk. Radiation damage modifies the material´s bulk trapped inventories by increasing steady trapping center concentrations.

An experimental program has been recently launched in CIEMAT labs., to quantify radiation effects on H transport characteristic and the final derived impact of (H´) on the modification of the ceramic opto-electronic characteristics.

In the present work a parametric transport assessment is done in order to have a wide evaluation of permeation fluxes ranges and soluted/trapped inventories in the studied window materials policrystal Al_2O_3 with BeO as alternative in ICRH systems. Policrystal a-Al_2O_3, and BeO are also used as RF feed-throughs and in bushing systems.

TMAP7 [*G. Longhurst*, from INEEL] is the release-rate modeling tool used for the assessment.

The insulator operational scenarios (doses, electromagnetic fields, temperatures and H-species partial pressures) are analyzed. Special attention is paid on the ITER design assumptions for the values of (H)-species source terms, from both neutrals and/or implanted fluences. Available material transport data out-of-irradiation is discussed and taken as parametric reference base for this exercise.