Development of Simulation Codes to Treat Hydrogen Molecule Processes in Divertor Plasma Region including Divertor Plate

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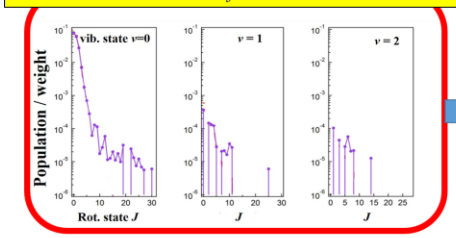
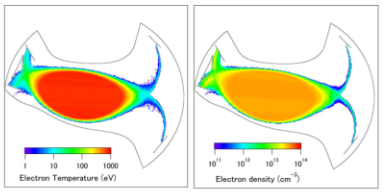
Combining the neutral-transport (NT) code including the rovibrationally resolved collisional-radiative (CR) model with the molecular dynamics (MD) simulation, we clarify the influence of the divertor plate accurately on the spatial distribution of hydrogen atoms and molecules (H, H_2) in the divertor plasma region.

Simulation results of the rotational level J dependence of population for three vibrational states (v=0,1, 2). The divertor material is amorphous carbon. Each color indicates the distance from the divertor.

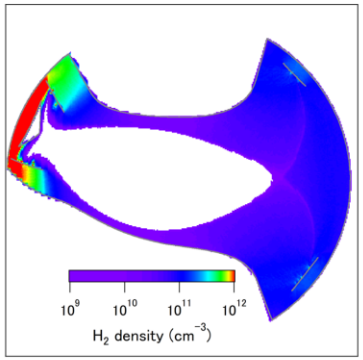


T_e & n_e by EMC3-EIRIRE

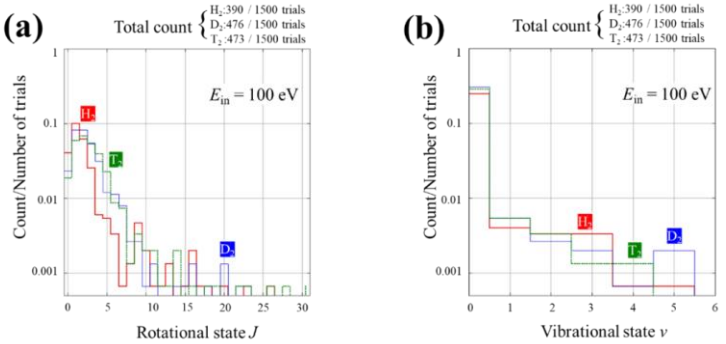


Neutral Transport code with CR model

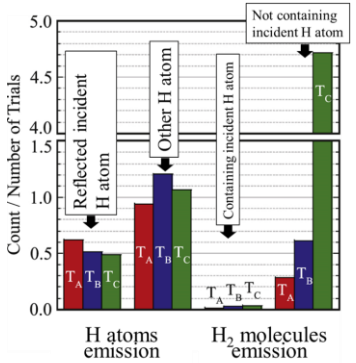
The 3-dimentional spatial distribution of H_2 in LHD by the combining three codes, i.e., (1)NT-CR code, (2)EMC3-EIRENE code and (3)MD code for carbon in our previous work[3]. In the present paper, we focus on the divertor plasma region not only for carbon but also tungsten as divertor plate material.



We calculated distributions of emission angle, translational, vibrational and rotational energy of emitted atoms and molecules for H_2, D_2, and T_2.



We calculated the desorption rate of H and H_2 from the tungsten crystal by the MD codes.



Number of emitted hydrogen atoms and molecules in 1500 trials in three cases of tungsten targets (T_A, T_B, and T_C). The number of hydrogen atoms in each tungsten target is 2272, 4368, and 6320 for T_A, T_B, or T_C, respectively. The number of tungsten atoms is set to 4608 for all tungsten targets.

PLASMA SIMULATOR