

Collisional-radiative modeling for H/D plasmas and S/XB ratio for measuring W sputtering yield

Tuesday, 16 May 2023 11:00 (30 minutes)

We report our recent works on collisional-radiative modeling (CRM) for H/D plasmas and S/XB ratio analysis for measuring W sputtering yield in KAERI plasma beam irradiation facility (KPBIF). The KPBIF was constructed and has been developed for simulating heat and particle fluxes in divertor plasma by adopting the concept of applied field-magnetoplasmadynamic (AF-MPD) thruster [1].

We have developed CRM for low temperature and density which solves nonlinear steady-state balance equations including processes such as radiation trapping and heavy particle collisions self-consistently [2,3]. The CRM has been applied to H/D plasmas in the electron temperature range of 2 – 7 eV and the electron density range of $10^{11} - 10^{13} \text{ cm}^{-3}$ which are relevant to present KPBIF conditions [4]. Particular attention has been paid to investigating sensitivities of line spectra intensities and densities of particles to used atomic and molecular data in the CRM. We used actual D reaction data for electron collision of D_2 molecule [5,6] as well as D_2^+ molecular ion collision of D_2 molecule [4], while some modelers used to replace e– H_2 data for D plasma assuming the e– D_2 data is very similar to e– H_2 data.

S/XB ratio for determine sputtering yield of W I [7] has been measured in KPBIF and analysed by modelling using various atomic data on electron impact ionization/excitation and radiative decay. The details on available data and data needs for improving the analysis will be discussed.

References:

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