Kinetics of W ions for the charge exchange recombination spectroscopy diagnostic for ITER

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Charge-exchange recombination spectroscopy (CXRS) remains one of the most important diagnostic methods for existing and future magnetic fusion devices. In particular, the CXRS with energetic neutral beams of hydrogen will be a key diagnostic tool for ITER where interactions with its important impurity, namely, tungsten, should result in new spectral features to be analyzed. The results of the present spectral synthesis are based on the new set of *nl*-resolved CX cross sections for recombination of the W^{q+} ions (q = 61-66) with atomic hydrogen calculated using the classical trajectory Monte Carlo method for the planned ITER neutral beams (diagnostic beam of 100 keV/u and heating beam of ~ 1 MeV/u). These calculated CX cross sections, along with the atomic data needed for other relevant physical processes, were used in a large-scale collisional-radiative model to study the population kinetics of atomic states of the tungsten ions and to generate the synthetic spectra across a wide range of photon energies. The simulations show that the CX-induced emission may drastically modify the observed spectrum in the visible and VUV ranges, which can provide important predictions for interpretation and evaluation of the CXRS diagnostics on ITER. Details of the theoretical calculations and results will be presented and discussed.