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Further requirement of tungsten atomic data for tungsten influx estimation at EAST plasma edge

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Upper and lower graphite divertor in EAST tokamak have been updated to tungsten divertors in 2014 and 2021 respectively to investigate the tungsten divertor operation and to realize high-performance long pulse discharge. Therefore, studies on the tungsten behavior are crucially important for improving the plasma performance. For the purpose four fast-time-response [1-2] and four space-resolved [3-4] extreme ultraviolet (EUV) spectrometers have been installed on EAST to observe line emissions from tungsten ions and their intensity radial profiles in wavelength ranges of 5-520Å.
Photon emission coefficient (PEC) data for W45+ at 62.336 and 126.998Å, W43+ at 61.334 and 126.29Å have been used to estimate density profiles of W45+ and W43+ ions in the bulk plasma [3,5]. Tungsten unresolved transition arrays (W-UTA) in the long wavelength range of 168-225Å, 225-268Å and 278-332Å observed from typical EAST ELMy H-mode plasmas are analyzed for the study of edge tungsten behaviors. As a result, three lines of 186.28 Å, 190.48 Å and 192.02 Å with relatively strong intensities emitted from W8+ ions could be confirmed by comparing with the time behaviors of well-known line emissions from W6+ at 216.219 and 261.387 Å [6,7], W7+ at 200.367 Å and 200.483 Å [8] and W27+ at 49.403Å [1-4]. Therefore, the ionization per photon coefficients, S/XB, for the lines from weekly ionized ions are therefore required to estimate the tungsten influx at plasma edge. Additionally, visible spectrometer with spatial viewing range covering the whole EAST poloidal cross section have been newly developed for the attempt of investigating the radial profile of line emissions of M1 transitions from W26+-W28+ and W8+-W12+ ions which have been observed in LHD [9] and EBIT [10] respectively. Calculation of full radial profiles of impurity density and influx will be attempted using the PEC and S/XB data of the observable lines.

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