Observation of Indirect Ionization of W^{7+} in EBIT plasma

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Based on the previous study by Mita *et al.*[1], the spectra of W^{7+} are measured in the visible and EUV range at SH-HtscEBIT[2] under extremely low electron beam energy conditions. The 574.49(3) nm M1 line of W^{7+} is observed at the nominal electron beam energy of 59 eV which is below the ionization energy of W^{6+}. The multi-configuration Dirac-Hartree-Fock calculation further confirms the identification of this line. A hypothesis of charge-state evolution from W^{5+} to W^{7+} is proposed, based on our theoretical studies on the energy levels of these charge states, in order to explain the appearance of W^{7+} spectra. Indirect ionization via cascade excitations from the long-lived metastable states of lower charge W ions play a key role in occurrence of W^{7+}. In addition, the EUV spectra at 75 eV as well as the FAC calculations also prove that W^{7+} appears 2 charge states in advance according to the ionization energy.

References

[1] M. Mita et al., Atoms **5**, 13(2017)
[2] J. Xiao et al., Proceedings of IPAC2013, **MOPFI066** (2013)