

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

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In this work, visible and EUV spectra of W^{7+} have been measured at high-temperature superconducting electron-beam ion trap (SH-HtscEBIT) under extremely low-energy conditions, and the atomic structure has been calculated by flexible atomic code (FAC) package using relativistic configuration interaction (RCI) method. The W^{7+} spectra are observed 2 charge states in advance according to its ionization energy. A hypothesis of charge-state evolution of W^{7+} is proposed based on the experimental and theoretical results. The W^{7+} ions appear via indirect ionization caused by cascade excitation between some metastable states of lower-charge-state ions from W^{4+} , at the nominal electron energy of 59 eV in SH-HtscEBIT.

Reference

- [1] Y. RALCHENKO, Plasma Fusion Res. **8**, 2503024 (2013).
- [2] J. Clementson, P. Beiersdorfer, E. W. Magee, H. S. McLean, and R. D. Wood, J. Phys. B At. Mol. Opt. Phys. **43**, 144009 (2010).
- [3] V. Jonauskas, R. Kisielius, A. Kynienė, S. Kučas, and P. H. Norrington, Phys. Rev. A **81**, 012506 (2010).
- [4] C. Biedermann, R. Radtke, R. Seidel, and T. Pütterich, Phys. Scr. **T134**, 014026 (2009).
- [5] Y. Ralchenko, I. N. Draganic, D. Osin, J. D. Gillaspay, and J. Reader, Phys. Rev. A **83**, 032517 (2011).
- [6] Y. Ralchenko, I. N. Draganic, J. N. Tan, J. D. Gillaspay, J. M. Pomeroy, J. Reader, U. Feldman, and G. E. Holland, J. Phys. B At. Mol. Opt. Phys. **41**, 021003 (2008).
- [7] Y.-J. Rhee and D.-H. Kwon, Int. J. Mass Spectrom. **271**, 45 (2008).
- [8] A. Kramida, Can. J. Phys. **89**, 551 (2011).
- [9] W. Li, Z. Shi, Y. Yang, J. Xiao, T. Brage, R. Hutton, and Y. Zou, Phys. Rev. A **91**, 062501 (2015).
- [10] F. G. Meijer, Physica **73**, 415 (1974).
- [11] J. Sugar and V. Kaufman, J. Opt. Soc. Am. **69**, 141 (1979).
- [12] J. Clementson, T. Lennartsson, P. Beiersdorfer, J. Clementson, T. Lennartsson, and P. Beiersdorfer, Atoms **3**, 407 (2015).
- [13] M. Mita, H. Sakaue, D. Kato, I. Murakami, N. Nakamura, Atoms **5**, 13 (2017).
- [14] M. F. Gu, Phys. Rev. A **70**, 062704 (2004).
- [15] X. Ding, J. Liu, F. Koike, I. Murakami, D. Kato, H. A. Sakaue, N. Nakamura, and C. Dong, Phys. Lett. A **380**, 874 (2016).
- [16] B. Tu, Q. F. Lu, T. Cheng, M. C. Li, Y. Yang, K. Yao, Y. Shen, D. Lu, J. Xiao, R. Hutton, and Y. Zou, Phys. Plasmas **24**, 103507 (2017).
- [17] A. E. Kramida and T. Shirai, At. Data Nucl. Data Tables **95**, 305 (2009).
- [18] A. Ryabtsev, E. Kononov, R. Kildiyarova, W.-Ü. Tchang-Brillet, J.-F. Wyart, N. Champion, C. Blaess, Atoms **3**, 273 (2015).