High-resolution tungsten spectroscopy relevant to the diagnostic of high-temperature tokamak plasmas and Researches on magnetic field induced transition

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The X-ray transitions in Cu- and Ni-like tungsten ions in the 5.19–5.26Å wavelength range that are relevant as a high-temperature tokamak diagnostic, in particular for JET in the ITER-like wall configuration, have been studied. Tungsten spectra were measured at the upgraded Shanghai- Electron Beam Ion Trap operated with electron-beam energies from 3.16 to 4.55 keV. High-resolution measurements were performed by means of a flat Si 111 crystal spectrometer equipped by a CCD camera. The experimental wavelengths were determined with an accuracy of 0.3–0.4 mÅ. All measured wavelengths were compared with those measured from JET ITER-like wall plasmas and with other experiments and various theoretical predictions. It was found that such an extension brings the calculations closer to the experimental values in comparison with other calculations.

Magnetic field induced transition was studied systematically, especially with Ne-like and Cl-like isoelectronic ions. And an accidental degeneracy of quantum states in Fe^{9+} was found which induced a novel method to determine magnetic fields in low density plasma.

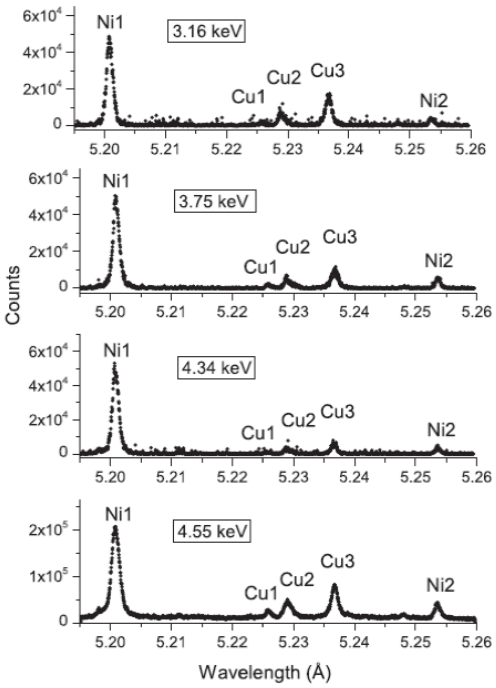

Figure 1. X-ray spectra of Cu- and Ni-like tungsten ions measured on the upgraded Shanghai EBIT for electron-beam energies of 3.16, 3.76, 4.34, and 4.55 keV.