

Data of Heavy Elements for Light Sources in EUV and XUV and Other Applications

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The spectra of photoemissions due to the transitions between the sub-shell levels in N-sub-shell open atomic ions are of interest for the strong influence from the interactions between the electronic state configurations with different constituent orbitals. The spectral narrowing of the unresolved transition array (UTA) [1] is advantageous for extreme ultraviolet (EUV) light sources. For shorter wavelength light sources, we should investigate the heavier elements. The wavelengths of the 4d - 4f transitions are reported to be, for example, 7.9 nm for Nd (Z=60), 7.0 nm for Eu (Z=63), and 6.8 nm for Gd (Z=64) [2]. Recently, the 4d-4f transitions of Tb at 6.5 nm have been investigated theoretically by Sasaki et al [3].

The photoemissions from W atomic highly charged ions have recently also drawn a strong attention because W has been considered as one of the wall materials in magnetic confinement fusion (MCF) devices. In intermediate stages of ionizations W ions also have open N-sub-shells and exhibit complex emission spectra due to configuration interaction.

Data of atomic ionic states and transition properties of the elements with the atomic numbers Z ranging 50 ~ 80 are indispensable for the development of the devices using the plasmas containing such heavy elements. We will review the data production and compilations and investigate the current status of the study in this field. We also discuss the recent spectroscopic measurement for W, Gd, and Nd using Large Helical Device (LHD) [4].

REFERENCES

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