SPECTRAL ANALYSIS OF EUV EMISSIONS FROM LANTHANIDE METAL ATOMIC IONS IN LARGE HELICAL DEVICE (LHD) PLASMAS (S31)


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Measured EUV Spectra of Gd ions in LHD plasmas

Gd (Z=64) EUV emission spectra from LHD plasmas. The Gd atoms are injected as a tracer into the LHD plasmas with 2~3 keV of the electron temperature.

Four discrete lines are also observed around 7.5 nm, which are expected to be the higher charge state Gd ions.

Spectral structures centered at 6.8 nm and 4 spectral lines at 7.279 to 7.586 nm are of Gd ions.

Upper entry: Time variation of stored energy (Wp, black curve) and radiation amount (Prad, red curve).
Lower entry: Time variation of the spectra around 7 nm measured by SOXMOS.

Red curve: just before the TESPEL injection of 3.8 s duration.
Green curve: 3.9 s,
Blue curve: 4.1 s,
Light blue curve: 4.3 s, and
Violet curve: 4.5 s after the start of TESPEL injection, respectively.
Grey curve: 4.7 s, which is the time of plasma dislaption.

Summary:
1. Photoemissions of Gd ions have been observed.
   a. 4d-4f transition arrays have been observed at 6.8 nm.
   b. 4 discrete lines at 7.729 to 7.586 nm have been observed.
2. Photoemissions of Nd ions have been observed.
   a. 4d-4f transition arrays have been observed at 7.9 nm
3. Precise theoretical atomic structure calculations have been carried out to identify the observed lines.
4. Further extensive experimental work are desired for Gd and Nd ions.
5. The extension of the experiments to the species such as Tb is to be planned.

Measured EUV Spectra of Nd ions in LHD plasmas

Nd (Z=60) EUV emission spectra from LHD plasmas. The Nd atoms are injected as a tracer into the LHD plasmas with 2~3 keV of the electron temperature.

Several line spectrum from higher charge state ions are observed in the range 8.4 to 9.0 nm.

4d-4f and 4p-4d transition arrays are observed at ~7.9 nm, which are at slightly longer wavelength range compared to the spectrum from the lower temperature plasmas.

Upper entry: Time variation of stored energy (Wp, black curve) and radiation amount (Prad, red curve).
Lower entry: Time variation of the spectra around 8 nm measured by SOXMOS.

The colors of the spectral profiles indicate the time points when the measurements are carried out.

Distribution of gA-factors from multiple charge states

No data available in the image for this section.