Reliable analysis of plasma-facing materials (PFMs) is indispensable to understand plasma-surface interactions (PSIs). Glow-discharge optical emission spectroscopy (GDOES) is a technique to measure depth profiles of constituent elements in a solid sample by detecting emissions from atoms accommodated in plasma by sputtering. The benefits of this technique are:

1. PFMs used in fusion devices can be analyzed without modification (no ultra-high vacuum, large sample is acceptable),
2. high depth resolution (a few nanometers), and
3. very quick measurements (several minutes)

In PSI studies, we need to measure depth profiles of H, D, T and He. In the present study, the abilities of GEOES for (1) isotopic measurements of hydrogen and (2) detection of He have been examined.

**Isotopic Measurement of Hydrogen**

Various kinds of alloys (F82H reduced activation ferritic steel, stainless steels, Zircaloy-2, etc.) were oxidized in H$_2$O and/or D$_2$O at around 300 °C for various periods of time.

Depth profiles of H and D were analyzed by adjusting optics arrangements under conventional plasma conditions (600 Pa Ar, 35 W, anode diameter 4 mm).

H and D were detected distinctly, and profiles at oxide-metal interface were successfully measured. GDOES allows profile measurements of hydrogen isotopes at interface between dissimilar materials such as deposited layer and PFMs. This type of measurement is difficult with SIMS due to difference in secondary ion yields.

**He Measurement**

Measurement of He with GDOES is relatively difficult because energy for He excitation (> 20 eV) is high compared with the first ionization potential of Ar (15.8 eV). Hence, we employed high power, high pressure Ne plasma to detect He because of higher ionization potential of Ne (21.6 eV).

The depth profile of He implanted into tungsten up to fluence of $3 \times 10^{21}$ m$^{-2}$ at 8 keV and room temperature was measured under the following conditions:

He I (587.562 nm), Anode diameter: 10 mm
Ne plasma (1200 Pa, 80 W).

**Summary 1:** Profiles of H and D could be measured distinctly!

**Summary 2:** Profiles of He was successfully measured with Ne plasma!