

PLATAN 2024 - Merger of the Poznan Meeting on Lasers and Trapping
Devices in Atomic Nuclei Research and the International Conference on
Laser Probing



Contribution ID: 126

Type: **Poster Presentation**

Resonance Ionization Mass Spectrometry by Switching Fundamental/SHG Operation of Ti:Sapphire Laser toward Multi-element Isotopic Analysis

In the decommissioning of the Fukushima Daiichi Nuclear Power Plant, a wide variety of samples containing fission products, nuclear fuel materials, actinide nuclides, and other materials are required to be analyzed. Resonance ionization mass spectrometry is suitable for the isotope analysis of such complex samples because it does not suffer from isobaric interference. For efficient resonance ionization, a scheme combining the fundamental and second harmonic generation (SHG) of Ti:Sapphire laser systems should be adopted. We developed a modified grating-type Ti:Sapphire laser that can instantly switch between fundamental and SHG operation modes, named mode switching Ti:Sapphire laser. Rapid changeover of Cs/Sr resonant ionization using two sets of the mode switching Ti:Sapphire laser with a beam path combination system was demonstrated. The characteristics of the laser and its application to Sr isotope ratio analysis will be presented.

Acknowledgment: This work was supported by JAEA Nuclear Energy S&T and Human Resource Development Project through concentrating wisdom Grant Number JPJA21P21465814.

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Session Classification: Poster Sessions