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DETECTION OF RHENIUM IN TUNGSTEN USING LIBS WITH ADDITIONAL FAST PULSE DISCHARGE

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Abstract. The diagnostics of the first wall of future fusion reactors represents a major source of information about the state of the machine and the expected lifetime of the first wall components. As the absorption of neutrons can cause induced radioactivity of the first wall tiles, it is of the essence to monitor the amount of absorbed neutrons. One possibility to monitor them is via nuclear transmutation reaction where tungsten absorbs neutron and create rhenium core [1]. Therefore by assessing the amount of rhenium present in the material, the number of absorbed neutrons can be deduced. In this work Laser Induced Breakdown Spectroscopy (LIBS) combined with fast pulse discharge was used to assess the concentration of rhenium. The main result is the amplification of line intensity and signal to noise ratio compared to the classical LIBS setup at reduced pressure. This results is of particular importance since only small amounts of rhenium are expected to be found, therefore making this approach suitable for this type of diagnostics. Additionally, univariate calibration method based on intensity ratio of W I 488.7 nm and Re I 488.9 nm spectral lines was proposed for determination of rhenium concentrations.

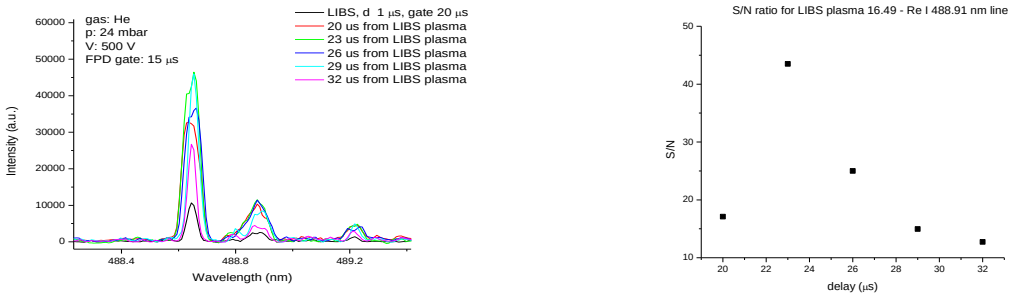

Figure 1: Amplification of Re I 488.9 nm line intensity with FPD (left) and resulting signal to noise ratio (right).

References

Ibano et al, *Journal of Nuclear Materials* **522** (2019) 324-328