

Heavy metals trace detection in water by LIBS using droplet levitation & CW laser drying – comparison with and without NE.

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The analysis and monitoring of cadmium (Cd) and other heavy metals in liquids is an important task for many fields¹. Laser-Induced Breakdown Spectroscopy (LIBS) has challenges when analysing liquids due to different processes of the laser pulse-liquid interactions². Different approaches to overcome these problems have been coupled to the LIBS technique³. A novel approach to sample the liquids for LIBS is the acoustic levitation of isolated droplets⁴. The radiation from a CW-IR laser leads to the evaporation of a levitated droplet and preconcentrates the analyte contents, providing a better LIBS signal⁵. A method to enhance even further the water/alcohol-based liquids LIBS analysis is the use of nanoparticles (NP)⁶. The NP are capable to do an enhancement of the intensity of the lines, this is usually referred to in the bibliography as NE LIBS. NE LIBS-Lev was used in our group for comparing the enhancement of the signal from aqueous solution of CdSO₄ and C₄H₆O₄Pb to 200ppm and 20ppm from the heavy metals. The solution was mixed with a colloidal suspension of AgNP at 10 mM and 100 μM in order to study the effects of the quantity of NP. The spectra were recorded using an Echelle spectrometer (M5000, Andor Tech.) equipped with an iCCD camera (iStar DH743, Andor Tech.). Figure 1 shows the enhancement of 1.4x and 2.3x in the intensity of the Cd I and Cd II emission lines (which are strongest emission of Cd in the range from 200 – 850 nm). A broader discussion of the behaviour of other species and other heavy metal/NP concentration inside the sample will be presented.

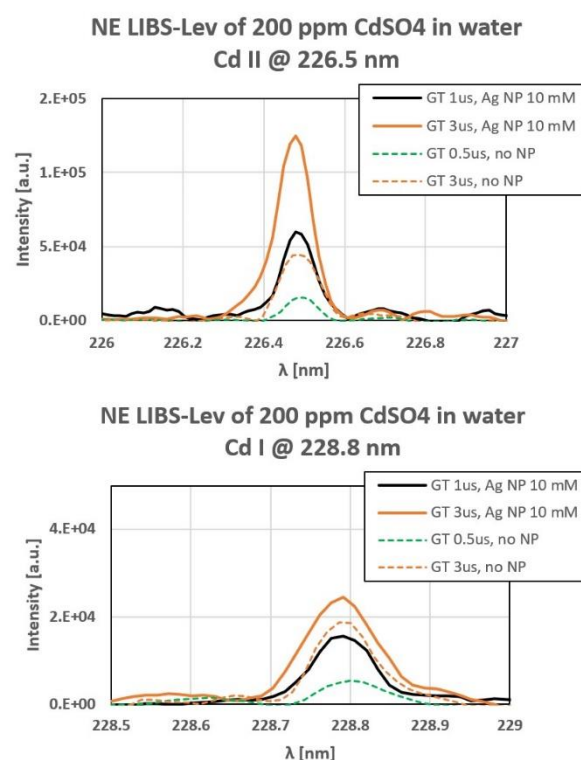


Figure 1. The effect of the AgNP over Cd I, Cd II lines.

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