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Enhancement of Laser-induced Breakdown Spectroscopy (LIBS) Signal Subject to the Magnetic Confinement and Dual Pulses*

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In this work, a comparative study for the laser-induced breakdown spectroscopy (LIBS) of aluminium (Al) target has been performed by using the two kinds of enhancement techniques namely, magnetic confinement and double pulse-LIBS (DP-LIBS). Firstly, the signal enhancement of Al plasma by combining the LIBS with an external magnetic field was exposed. Secondly, the signal enhancement by configuring the dual-pulses action in LIBS was performed. We found that the optical emission lines and plasma parameters (electron temperature and density) showed significant enhancement in the presence of magnetic field and DP-LIBS. During the magnetic confinement, the maximum enhancement factors of about 6 and 8 were achieved for the spectral line Mg (II) 279.5 nm and Al (II) 280.1 nm, respectively. An enhancement factor was reached up to 12-folds for the various spectral lines in DP-LIBS. Our results have significance in improving the LIBS sensitivity.

Keywords: LIBS, spectral lines, magnetic confinement, Boltzmann, dual pulses.

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