

4 - 5 Collinear Double-pulse Laser-induced Breakdown Spectroscopy of Air

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Double-pulse laser-induced breakdown spectroscopy (DP-LIBS) is an effective method to increase the LIBS signal intensity. However the mechanism of the signal enhancement is not clearly understood till now. In this work, collinear configuration DP-LIBS combining 35 mJ 355 nm laser and 30 mJ 532 nm laser in air was studied.

The influence of delay time between laser pulses for spectra enhancement was investigated. Fig. 1 shows the variation of enhancements factor versus the delay time between laser pulses. It can be seen that the optimum delay time is 20 ns in our experiments and 14~47 fold signal enhancement was observed from the DP-LIBS comparing to SP-LIBS at this delay time. The plasma parameters were analyzed and plasma emission images were recorded in order to investigate the fundamental proess of DP-LIBS. Fig. 2 shows the emission images of air plasma versus delay time between the laser pulses. The relationship between the excitation energy levels and its enhancement factors was also demonstrated. The results indicated that the double-pulse laser lead to higher values of excitation temperature, electron density and larger plasma volume.

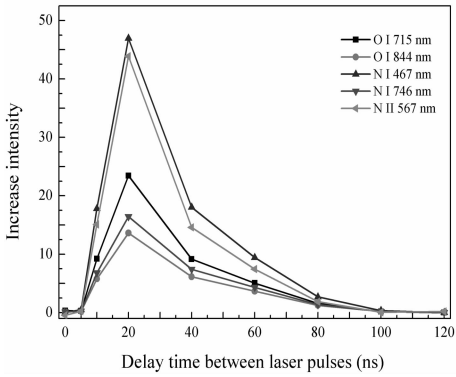


Fig. 1 Enhancement factor versus with the delay time between laser pulses.

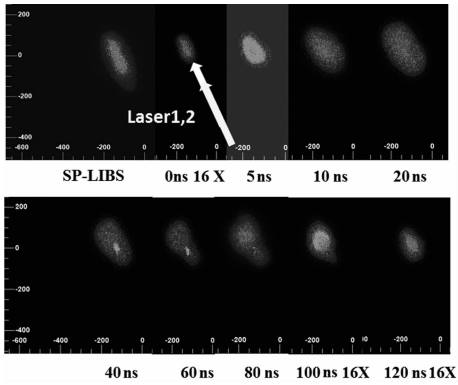


Fig. 2 Emission images of air plasma versus delay time between the laser pulses.

Reference

[1] V. I. Babushok, F. C. DeLucia, J. L. Gottfried, et al. , Spectrochimica Acta, B61(2006)999.