

DEVELOPMENT AND TESTING OF LASER INDUCED BREAKDOWN SPECTROSCOPY TECHNIQUE

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Our system for time-resolved laser induced fluorescence (TR-LIF) measurement is described in [1,2]. First published results could be found in [2]. Nd:YAG laser used in our TR-LIF experiments is powerful enough (365 mJ at 1064 nm, variable OPO output >5mJ), so the system could be used for laser induced breakdown spectroscopy (LIBS), also. In this paper preliminary results regarding development and testing of LIBS technique based on our laser system are presented. The system for LIBS measurements is shown schematically in Fig. 1. Compared to the TR-LIF system presented in [1,2], it is easily noted that focusing lens is added. To be on the safe side regarding Hamamatsu Streak Camera, preliminary experiments were made using OPO output (5 mJ at 400 nm) and Ocean Optics spectrograph. It should be noted that using of streakscope enables time resolved diagnostics.

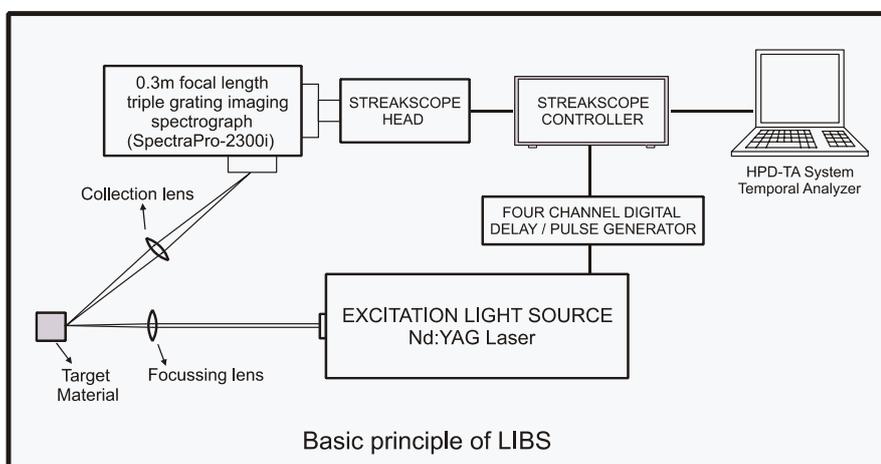


Fig. 1: Our TR-LIF system modified for LIBS experiments.

To test the LIBS technique developed in our laboratory the silver was chosen because there are many references with which we could compare our results [3-7] and because silver is easily obtained. Energy of OPO output was not enough to produce plasma in silver water, but made visible ablations on surface of silver spoon and bracelet.

LIBS signal obtained from silver bracelet is shown in Fig. 2. Ablation of the surface was noticeable after one shot. Because sample was excited by OPO output (400 nm, 5 mJ), the second harmonic (532 nm), fourth harmonic (266 nm) and the idler (800 nm) are also visible on the spectrum.

Sterling silver, alloy used for silver jewelry, contains about 92.5% of silver and 7.5 % of other metals, usually copper. (It seems that lines at about 521 nm corresponding to silver and copper are overlapped on Fig. 2.) The resonance spectral lines of Ag I ($5s^2S_{1/2} - 5p^2P_{3/2}$) at 328 nm and ($5s^2S_{1/2} - 5p^2P_{1/2}$) at 338 nm have been observed and illustrated in Fig.2. The other two lines denoted in Fig.2 correspond to the transitions: ($5p^2P_{1/2} - 5d^2D_{3/2}$) at 521 nm and ($5p^2P_{3/2} - 5d^2D_{5/2}$) at 547 nm [8, 9].

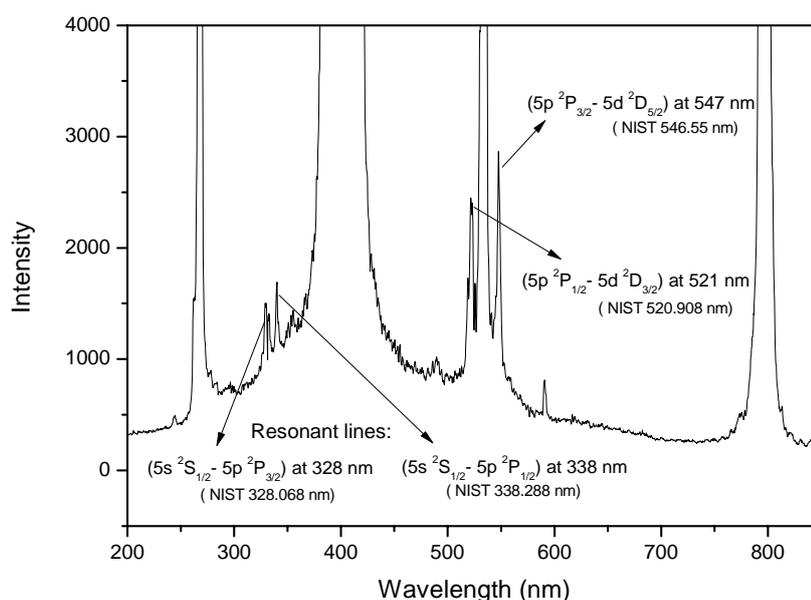


Fig. 2: LIBS signal obtained from silver bracelet.

Acknowledgments

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