ABSTRACT

Laser-induced breakdown spectroscopy (LIBS) is a type of atomic emission spectroscopy (AES), which uses a highly energetic laser pulse as the excitation source, the emission spectrum of the produced plasma will be analyzed via optical spectrum analyzer.

In this project, it is designed and built an integrated system using a passively Q-switched Nd:YAG laser system with 9 ns pulse duration and employing nonlinear crystal (KDP for SHG) and (LBO for THG), a new laser wavelength has been generating 532nm and 355nm with 6 ns pulse duration, the change of laser energy gives the ability to change the intensity and to study the characteristics of the system, using (20, 40, 70, and 80 mJ).

The collimator lens and fiber optics are the confinement elements to the spectra analysis unit. Spectrometer with 0.5nm optical resolution and spectrum range 320 – 750 nm has been used to analyze the induced emission spectrum. A computer program has also been designed for comparison between the results and database, by using the language of C #.

The experimental part of this project has been focused on building calibration of the system with laboratory experiments to build database of different elements (Al, Cu, Cd, Co, Mn, Ni, Pb, and Zn). Thereafter, the test industrial alloy is (Low carbon steel) to detect their main components via LIBS and to compare the final results with reliable new global system X-ray fluorescence (XRF), the system shows new elements that XRF system cannot detect, there are no sample probation, low cost test and best resulted.