

DEVELOPMENT OF A DIFFRACTION SPECTROMETER FOR LIBS APPLICATIONS

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ABSTRACT

This article presents the design and construction of an optical spectrometer for use in LIBS (Laser-induced breakdown spectroscopy) systems. Based on a reflection diffraction grating and other commercial optical elements, the spectrometer incorporates photographic lenses of 50 mm f 1.4 and 135 mm f 2.8 as collimating and camera lenses, respectively. A mechanical system was developed to allow for the rotation of the grating and the adjustment of the slit size. A monochromatic CCD camera with an external trigger was used as the optical detector. The spectrometer was designed to have a spectral resolution of 0.27nm and a spectral range of 76.9nm in the visible. A program for the conversion of image data to spectra was created and includes a routine to reduce noise through pre-processing of the raw images. This noise-reducing procedure increased the signal to noise ratio by 13. A numerical processing program allows for the wavelength calibration across a range of wavelengths (the spectrometer may be set to measure different intervals) by using as a reference different emission lines of mercury (Hg).

Keywords: Classic Spectrometer, CCD Camera, Digital Image Processing.