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A Plasma Based OES-CRDS Dual-mode Portable Spectrometer for Trace Element Detection: Emission and Ringdown Measurements of Mercury¹ PEEYUSH SAHAY, SUSAN SCHERRER, CHUJI WANG, Mississippi State University, LASER SPECTROSCOPY AND PLASMA TEAM — Design and development of a plasma based optical emission spectroscopy-cavity ringdown spectroscopy (OES-CRDS) dual-mode portable spectrometer for *in situ* monitoring of trace elements is described. A microwave plasma torch (MPT) has been utilized, which serves both as an atomization and excitation source for the two modes, viz. OES and CRDS, of the spectrometer. Operation of both modes of the instrument is demonstrated with initial measurements of elemental mercury (Hg). A detection limit of 44 ng mL⁻¹ for Hg at 253.65 nm was determined with the emission mode of the instrument. Severe radiation trapping of 253.65 nm line hampers the measurement of Hg in higher concentration region (> 50 μg ml⁻¹). Therefore, a different wavelength, 365.01 nm, is suggested to measure Hg in that region. Ringdown measurements of the metastable 6s6p ³P₀ state of Hg in the plasma using a 404.65 nm palm size diode laser was conducted to demonstrate the CRDS mode of the instrument. Along with being portable, dual-mode, and self-calibrated, the instrument is capable of measuring a wide range of concentration ranging from sub ng mL⁻¹ to several μg ml⁻¹ for a number of elements.

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