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(U*) The Use of Silver Microparticles for Spectrum Emission Enhancement During Laser-Induced Breakdown Spectroscopy of Bacterial Specimens.

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Laser-induced breakdown spectroscopy (LIBS) is a laser-based spectrochemical technique that allows a near-instantaneous measurement of the elemental composition of a target by making time-resolved spectroscopic analyses of laser-induced ablation plasmas. Utilizing nanosecond laser pulses and a broadband high-resolution Echelle spectrometer, high signal-to-noise optical emission spectra can be obtained from almost any desired target.

Recently it has been shown by others that ablation of a non-metallic target that has been coated with metallic (gold or silver) nanoparticles causes an increase in optical emission intensity due to the creation of a plasma with a higher temperature and higher electron density. This process is called "nanoparticle enhanced"LIBS or NELIBS. In our laboratory we have begun investigating whether cheaper and easier to acquire monodisperse metallic microparticles can be used to enhance the emission from bacterial cells when they are deposited upon a nitrocellulose paper filter medium.

This presentation will detail our efforts to build a small deposition chamber to reliably and reproducibly deposit a known mass of commercially obtained one micron silver microparticles. The silver microparticles must also be uniformly deposited over the surface of the 9 mm diameter filter medium (achieving a uniform surface mass density) to insure that the enhancement is consistent over the one millimeter diameter circular bacterial deposition area in the center of the filter.

A nominal surface coverage density of 0.026 µg/mmˆ2 of silver microparticles was achieved, resulting in a silver ablation mass of 110 pg per laser shot. Using this mass surface density, enhancement of the emission from the different elements present in the bacterial cells was observed and was found to not be consistent, varying from an enhancement factor of 1 up to 8. Efforts to exploit and further develop this phenomenon for detecting lower numbers of bacterial cells will be described.

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