**Bacillus thuringiensis** Detection and Characterization by Normal Raman and SERS at logaritmic and stationary growth phases

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**Abstract**

Spectroscopic techniques such as Normal Raman (NR) and Surface Enhanced Raman Spectroscopy (SERS) are considered fast, in vivo alternative methods for identification of microorganisms. These techniques provide important information about the spectroscopic signatures of cellular components in vitro or in vivo organisms. The techniques have significant benefits for Industrial Microbiology, Food Microbiology and biological warfare agents detection. The proposed method of this work is the use of vibrational Raman techniques as NR and SERS and to detect bioaerosol particles of *Bacillus thuringiensis* (Bt) employing a fast and simple synthesis of silver colloids based on reduction of silver nitrate with hydroxylamine hydrochloride and sodium citrate including pH changes to modify the surface charge of the nanoparticles (NP) to study the interaction of the NP and the bacteria.

**State of the Art**

Based on the current status of world wide antiterrorism efforts there is a need to develop effective standoff detection techniques for biological agents. Using spectroscopic techniques the target of this study, Bt, will provide a molecular identification of the strain. These gram positive bacteria are recognized for their toxicity on larvae and are used commercially as insecticides. *B. thuringiensis* was chosen due to its similarity with *B. anthracis* which has a potential of being used during terrorist attacks. Both of these bacteria form spores which are able to tolerate extreme environments and make them suitable for transport before or during a biological attack.

**Methodology**

**Synthesis of metallic nanoparticles for SERS experiments**

**Hydroxylamine nanoparticles**

**Citrate nanoparticles**

**Changes of pH in colloidal nanoparticles**

**Bacillus thuringiensis** preparation

**Hydroxylamine reduced Ag-NP**

**Citrate reduced Ag-NP**

**Results**

**Synthesis of Ag-NP for SERS experiments**

**Absorbance**

**Influence of pH on the plasmon band of silver-hydroxilamine nanoparticles**

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**Challenges and Technology Transfer**

Normal Raman Spectroscopy (NRS) and Surface Enhanced Raman Spectroscopy (SERS) can be used as quick methods for liquid bacterial detection in suspension and as bioaerosol particles with great interest on standoff detection.

This project was supported by the U.S. Department of Homeland Security under Award Number 2008-ST-061-ED0001. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Department of Homeland Security.