

# Deep UV Raman Spectroscopy for Detection and Identification of Gunshot Residue for Forensic Investigations

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## Abstract

Gunshot residue (GSR) are particles discharged from a firearm and are a mixture of the partially burned primer and gunpowder from the bullet. GSR can be divided into organic (OGSR) and inorganic (IGSR) components. OGSR and IGSR particles differ in size. OGSR particles are macroscopic and consist of chemicals from the propellant, while IGSR particle size ranges from 1-10  $\mu\text{m}$  and originates from the primer and cartridge.

The collection and analysis of such minuscule trace evidence requires not only proper handling and advanced characterization techniques, but those techniques should be non-destructive due to the possibility that the evidence that can be collected at a crime scene is limited and could be needed for further analysis. Tape- and adhesive disk-lifting are the most common ways to collect the GSR particles.

Raman spectroscopy is a fast, sensitive, and non-destructive technique that has been used in a variety of forensic applications. The excitation wavelengths for analysis are typically in the NIR range. Deep ultraviolet Raman spectroscopy (DUVRS) provides additional capabilities due to the resonance Raman effect. Our laboratory has recently reported on the detection of OGSR on tape using fast fluorescence mapping followed by confirmatory identification using Raman microspectroscopy with visible and near-IR excitation. A proof-of-concept study of GSR using DUVRS will be discussed in this poster.

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