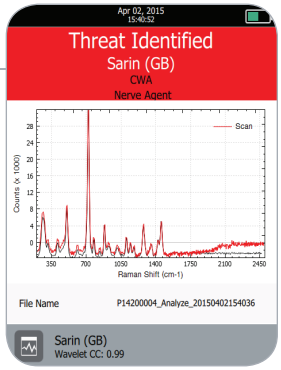
DETECTION OF MUNITIONS GRADE CHEMICAL WARFARE AGENTS USING HANDHELD RAMAN

- Shorter scan times
- Identify in the field
- Measure wider range of compounds



History shows that chemical warfare agents (CWAs) are the most widely proliferated and used weapons of mass destruction (WMD). Unlike ultrapure laboratory grade chemicals, munitions grade CWAs used in these attacks are likely to contain impurities from the storage container, degradation, or unreacted precursors, all of which often cause fluorescence when analyzed using 785nm based detection systems. In order to minimize fluorescence in these types of real world threats, Progeny ResQ uses a longer wavelength (1064nm) laser, which leads to more reliable identifications and short measurement times.

CHEMICAL IDENTIFICATION IN THE FIELD

To demonstrate the ability of 1064nm Raman to identify real world threats, spectra of munitions grade CWAs were collected using a Rigaku Progeny™ ResQ™ 1064nm handheld analyzer under secure conditions at Edgewood Chemical and Biological Center (Roy et al., 2015). These spectra were compared to library spectra of pure agent (examples shown in Figures 1-2). The high correlation between munitions grade spectra and library spectra indicate that matching algorithms confidently ID the threat.

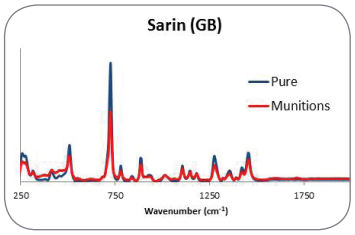


Figure 1. Pure (blue) and munitions grade (red) spectra of sarin (GB), collected at 1064nm.

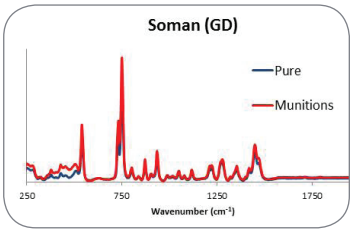


Figure 2. Pure (blue) and munitions grade (red) spectra of soman (GB), collected at 1064nm.

MINIMIZE SAMPLE INTERFERENCE

The fluorescence reduction of 1064nm Raman compared to 785nm Raman was demonstrated in the same study, where spectra of munitions grade CWAs were collected at both excitation wavelengths. For the munitions grade compounds in this study (examples shown in Figures 3-4), the Raman signatures were clearly visible for spectra collected on Progeny ResQ (which uses a 1064nm excitation laser), while the spectral features of the same compounds were obscured by fluorescence when analyzed using a 785nm based system.

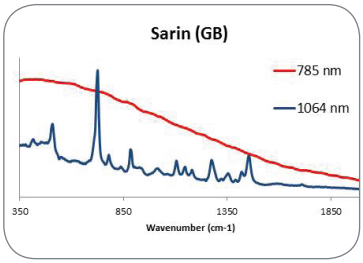


Figure 3. Raman spectra of munitions grade sarin (GB) collected at 785nm (red) and 1064nm (blue).

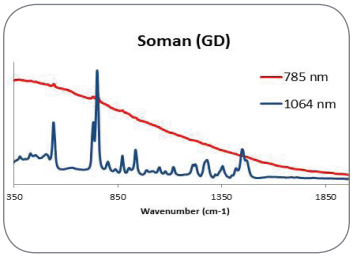


Figure 4. Raman spectra of munitions grade soman (GD) collected at 785nm (red) and 1064nm (blue).

CONCLUSION

The handheld Progeny ResQ has the ability to detect and identify both pure and munitions grade G Series nerve agents. In addition, it shows significantly less fluorescence than a spectra generated with a 785nm Raman. The military and first responders can expect shorter measurement times and the ability to measure a wider range of real world compounds.

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