Evaluation of Different Commercially Available Surface-Enhanced Raman Spectroscopy (SERS) – Substrates and Improved Methods for Detection of Explosives

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In recent years, explosive-based terrorism has grown enormously because improvised explosive devices (IEDs) are simple, easy to deploy and can cause enormous damage. There is a high demand for selective and sensitive methods for the trace detection of explosives which are fast, cheap and easy to use. Therefore, frequently used explosives like RDX, TNT, PETN and ammonianitrate are tested with different available SERS-substrates under different conditions to compare the sensitivity of detection. Among others the influence of the exciting wavelength was investigated. Here a 10^{-3} M Ammonianitrate solution was measured on a silver silmeco® SERS-substrate with different wavelengths (266nm, 532 nm and 785 nm). The spectra are shown in Fig. 1.

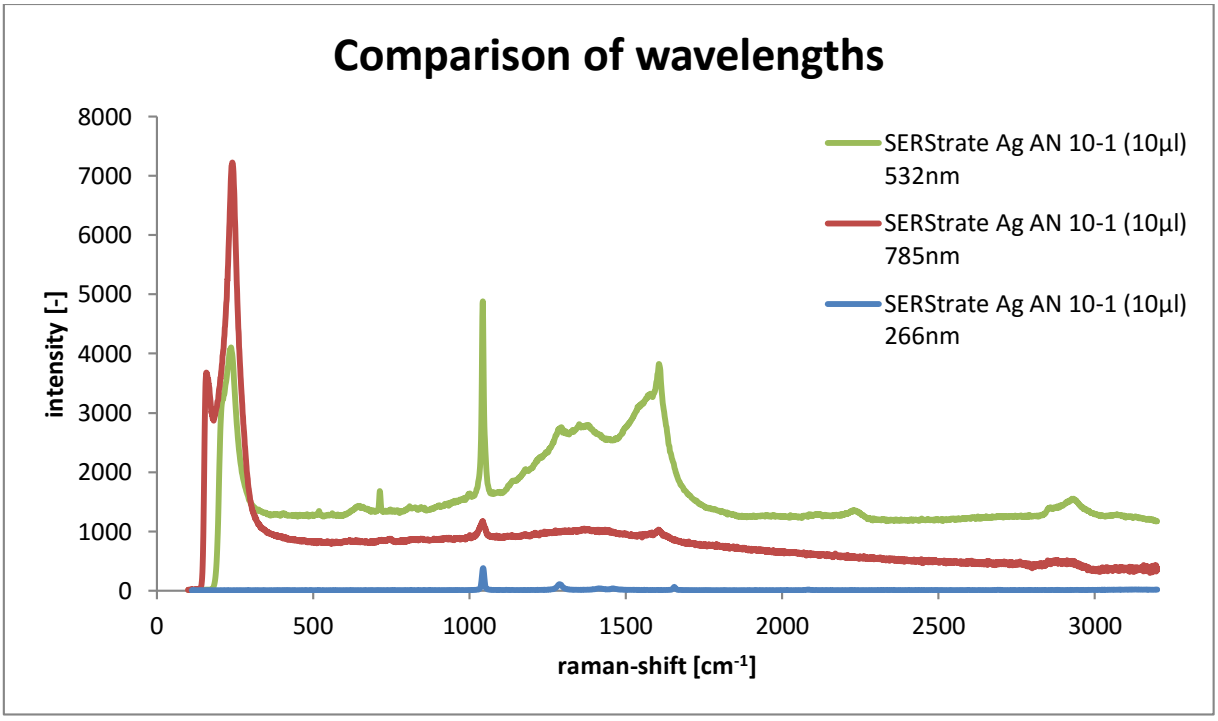

Fig. 1: Dependency of the SERS spectra of Amonianitrate from the exication wavelength (266 nm, 532 nm, 785 nm) on a silmeco® SERS-substrate

The SERS spectra show different sensitivity dependent on the excitation wavelength. The selected explosives could be detected with all tested SERS-substrates. We were able to proof the enhancement of the specific Raman-peaks. Through specific functionalization of the surface it's possible to use the substrates selectively for detection