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µLC-SERS SYSTEM USING SILVER-QUANTUM DOTS SUBSTRATE FOR THE SEPARATION AND DETERMINATION OF NUCLEIC ACID BASES

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There is a continued interest in the development of highly sensitive, molecular specific detection techniques in miniaturised separation systems such as capillary based liquid chromatography. Surface enhanced Raman scattering (SERS) is a promising detection technique but in order to be truly useful, a reliable analysis system must be achieved. Without such robustness SERS detection will not gain widespread acceptance in a combined system for analytical chemistry.

In the present work, we report the usefulness of an at-line capillary-liquid chromatography-(microdispenser)-surface-enhanced Raman spectroscopy coupling (Figure 1). The novel advances proposed here were the microdispenser used as interface and the type of SERS substrate employed for recording SERS spectra. As SERS-active substrate, a novel colloidal synthesis method where hydroxylamine based silver colloids are formed in the presence of CdSe/ZnS Quantum Dots (QDs) was reported. The ODs act as a co-reducer and form a link separator between the colloid particles establishing more controlled enhancement.

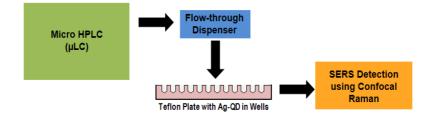


Figure 1. Overview of the hyphenated chromatographic separation and SERS detection system.

As an assessment of the effectiveness of the hyphenated µLC SERS system a mixture of purine and pyrimidine bases were separated as shown in Figure 2. The detection limits obtained were in the range 0.5-1 ng (of sample injected into the µLC column).

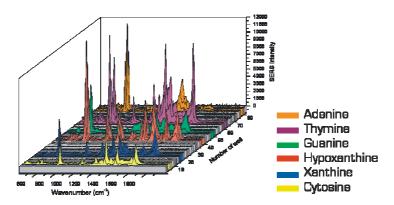


Figure 2. SERS spectra of the µLC separated purine and pyrimidine bases shown as a function of well position on the microtiter plate.