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Detecting STAMPs by SERS and MALDI-MS

Pascal Breuer¹, Freek Arie², Govert Somsen³, Peter Schoenmakers¹.

1. *University of Amsterdam, Faculty of Science, Van 't Hoff Institute for Molecular Sciences, Science Park 904, 1098 XH Amsterdam, The Netherlands, p.breuer@uva.nl*
2. *Vrije Universiteit, Faculty of Science, Biophotonics and Medical Imaging, De Boelelaan 1081, 1081 HV Amsterdam, The Netherlands.*
3. *Vrije Universiteit, Faculty of Science, Biomolecular Analysis and Spectroscopy, De Boelelaan 1081, 1081 HV Amsterdam, The Netherlands.*

Regarding: Abstract Oral/Poster (PhD)

Science is progressing towards understanding the composition and properties composition of very complex mixtures in ever increasing detail and preferably speed. To fully characterize these mixtures extremely high separation powers are required. The STAMP (Separation Technology for A Million Peaks) project, funded by the European Research Council (ERC), is aimed at obtaining a peak capacity of one million by using spatial three-dimensional liquid chromatography separations. One of the challenges within the project is the development of (imaging) detection principles for first, spatial two-dimensional liquid chromatography, and in a later stage, spatial three-dimensional liquid chromatography separations.

Since an interface between the spatial separations devices and existing detection techniques is lacking, an offline-method is proposed by STAMPing the effluent from the device on a modified substrate. In this research the use of an ordered monolayer of monodispersed polystyrene beads, on which a layer of either gold or silver was sputtered, was investigated. This well-defined “rough” surface allows for Surface Enhanced Raman Spectroscopy (SERS) as a STAMP detection technique. As SERS is commonly non-destructive, the STAMPs can subsequently be measured by Matrix-Assisted LDI (MALDI)-MS or even Surface-Assisted LDI (SALDI)-MS [1-2].

The surface was characterized by Scanning Electron Microscopy (SEM) to confirm the formation of an ordered monolayer, by a profilometer to measure surface roughness and by contact angle measurements to test the applicability with solvents common in Liquid Chromatography (LC). Afterwards STAMPs were created on the substrate by an in-house build STAMPbot and analyzed by SERS and SALDI/MALDI-MS.

[1] H. Chu, B. Unnikrishnan, A. Ananda, J. Mao, C. Huang. Nanoparticle-based laser desorption/ionization mass spectrometric analysis of drugs and metabolites. *Journal of Food and Drug Analysis* 26 (2018) 1215-1228.

[2] T. Satoh, H. Niimi, N. Kikuchi, M. Fujii, T. Seki, J. Matsuo. Solvent-free silver-nanoparticle surface-assisted laser desorption/ionization imaging mass spectrometry of the Irganox 1010 coated on polystyrene. *International Journal of Mass Spectrometry* 404 (2016) 1-7.