Development of novel surfaces for MALDI imaging

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Matrix-assisted laser desorption ionisation-mass spectrometry (MALDI-MS) is a soft ionisation technique suitable for the analysis of biomolecules and large organic molecules which are often sensitive to fragmentation [1]. MALDI-MS imaging (MALDI-MSI) is a relatively new and emerging MS technology. It was pioneered by Caprioli *et al.* [2] in 1997. The technique creates an image from lots of MALDI-MS spectra at regular intervals across a tissue section of one or a small range of *m/z* ions, giving a visual ion intensity distribution of the selected ion across the sample.

In MALDI-MS, the sample is co-crystallized with an excess of matrix material which strongly absorbs the 337nm nitrogen laser energy. Some energy is transferred from matrix to the sample and both are desorbed off the surface and brought into gas phase. Ionisation can happen at any time during this process, but the exact location and mechanism of ionisation is still not fully understood [1]. For MALDI-MSI, an image is created by collating the spectra using the above method and converted into ion intensity maps using a MATLAB based algorithm.

The matrix is an important aspect of MALDI, it protects the analyte from the intense laser beam, act as a proton source encouraging ionization and has a strong optical absorption. However, analysis of low molecular weight molecules using MALDI-MS/MSI is difficult due to matrix interference. Thus, mesoporous materials have been investigated by other groups, replacing the matrix in MALDI-MS. Its large surface area, regular pore distributions and ability to absorb UV light if titania is used [3] or matrix incorporated [4], makes it a desirable technique to over come the limations.

This study is to optimize a mesoporous surface so it can eventually be directly applied to a tissue cross section, which will hopefully overcome matrix interference.

References:

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