

## **Sub-2 $\mu\text{m}$ particulate HPLC columns for LC-MS-(MS): Benefits and limitations**

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The introduction of pressure stable sub-2  $\mu\text{m}$  spherical HPLC particles and the extension of the upper pressure limit for HPLC equipments (e.g. Ultra Performance Liquid Chromatography: UPLC) opened new frontiers in terms of LC resolution, sensitivity and speed. Peak widths produced by such analytical systems can approach 1 second, requiring more detection data points per time unit. This requirement presents no significant problems for analytical methods designed to quantify only a few analytes. Yet, multiresidue methods – as commonly used in the field of pesticides or veterinary drugs in food – require new concepts. Depending on the available quadrupole instrumentation, shorter dwell times and/or time programming of MS/MS transitions can be used. Such approaches are feasible, yet drifting analyte retention times require a careful and time consuming definition of time windows. Furthermore, the column flow presents another potential conflicting requirement. Depending on the given column diameter, the optimum linear velocity for the mobile phase has to be selected, to produce the best chromatographical resolution. The sensitivity of ESI or APCI interfaces are flow-dependent as well. The user has to therefore manage these two possibly diverging flow requirements.

Some applications utilizing such principles are presented. e.g. The sub-ppb quantification of a banned drug (chloramphenicol) in honey and the high-throughput screening of some 40 antibiotics in bovine urine from slaughtering houses. Benefits and limitations relevant to practical analytical work are critically discussed.

While modern tandem-mass spectrometry is suited for sub-2  $\mu\text{m}$  particles stationary phases, the full potential can only be released by using high speed MS techniques like TOF. The high resolution of sub-2  $\mu\text{m}$  chromatograms in combination with high speed, high resolution MS – as obtained by ESI-TOF – are expected to approach the selectivity of LC-MS-MS techniques. The much shorter chromatographical run times produced by sub-2- $\mu\text{m}$  particulate HPLC columns and the full scan sensitivity of TOF is defining new benchmarks in terms of resolution, speed and sensitivity.