

Critical evaluation of new generation of SFC instrument (Waters Acquity UPC²) and dedicated stationary phases and first application development for drugs analysis.

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Supercritical fluid chromatography (SFC) is a powerful strategy for the analysis of a wide range of analytes including non polar, polar, ionisable compounds and even more recently peptides. Moreover, high throughput and/or high resolution separations are achievable with low pressure drop, thanks to the low viscosity of the mobile phase.¹ Finally, the solvent consumption and associated costs and environmental impact are drastically reduced in SFC vs. LC.²

Despite its many advantages, SFC is struggling to impose as a competitive separation technique in analytical laboratories for various reasons. Indeed, performance reaches today in UHPLC are impressive³ compared to current poorly robust and sensitive SFC instruments.⁴ Furthermore, “old fashion” SFC configurations and volumes limit greatly the use of the last generation of narrow-bore columns packed with small particles. Finally, since organic modifier is generally added to extend the polarity domain of the supercritical CO₂, the kinetic performance achieved in SFC is generally lower than expected.

To overcome these limitations, a new dedicated SFC instrumentation, known as UPC² (Ultrapformance convergence chromatography), fully compatible with sub-2 μm particles packed columns, has recently been launched by Waters. In the present contribution, the UPC² system was fully characterized and compared with classical SFC and modern UHPLC platforms. Its inherent possibilities and limitations were assessed and critically discussed. Some strategies to further improve the system were also presented. Then, the available UPC² column chemistries were evaluated in terms of kinetic performance and selectivity using pharmaceutical compounds covering a broad range of physicochemical properties. Finally ultrafast separation of steroids (analysis time of ~ 40 s) and high resolution analysis of numerous antipsychotics (Peak capacity of > 250) demonstrate the real potential of the UPC² system.⁵

References :

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