Frontiers of Orbitrap mass spectrometry

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This talk presents first-hand a short but eventful history of Orbitrap mass spectrometry, from laying down the first principles to its current status as the leading mass spectrometric technique for high-resolution, high mass accuracy quantitative analysis.

Ever increasing requirements on throughput of mass spectrometric analysis are enabled by increasing speed of chromatographic separations and demand higher spectral acquisition rates and better control of different ion optical devices within mass spectrometers. Recent improvements in this area are exemplified for Q Exactive and Orbitrap Fusion families of instruments, with numerous new modes of operation enabled by parallelization of detection and ion processing and concerted operation of different ion-optical devices. A special emphasis is made on technical solutions that allow quantitative analysis in these instruments, despite Orbitrap analyzer being of an ion trapping type. New modes of data-independent, targeted and top-down acquisitions are overviewed.

In conclusion, future trends and perspectives of Orbitrap mass spectrometry are discussed, including its inroads into emerging areas of mass spectrometric analysis. It is shown that Orbitrap-based mass spectrometers possess compelling potential as an (ultra-) high resolution platform not only for high-end proteomic applications but also for screening, trace and targeted analysis by LC/ and GC/MS.