High Resolution Mass Spectrometry

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Results and Discussion

This review focuses on recent advances in instrumentation, techniques, and applications of the highest resolution mass analyzers (multipass time of flight (TOF), orbitrap, and Fourier transform ion cyclotron resonance (FT-ICR) since a prior similar *Analytical* Chemistry review in 2008.[1] Following a brief discussion of the need for high mass resolution, we proceed to mass analyzer types and their development and applications for bio-analysis (e.g., proteomics, lipidomics, drug discovery) and complex organic mixtures (environmental, petroleum, metabolomics). **Figure 1** is an example of a state-of-the-art FT-ICR mass spectrum for a complex organic mixture, showing baseline resolution of species whose masses differ by only 0.0011 Dalton (i.e., about twice the mass of an electron).

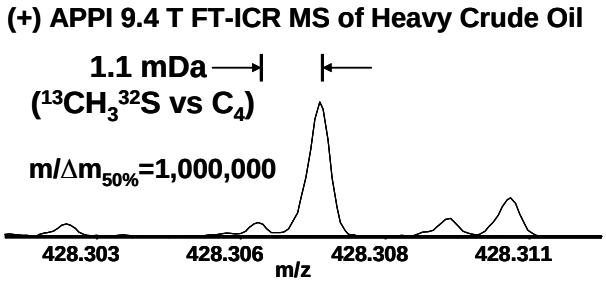

Figure 1. Positive ion atmospheric pressure photoionization (APPI) 9.4 T Fourier transform ion cyclotron resonance (FT-ICR) mass spectrum of a petroleum crude oil. Upper inset: Mass scale expansion revealing 90 singly-charged ions within a mass range of 0.32 Da. Lower inset: Baseline resolution of ions differing in mass by 1.1 mDa, made possible by ultrahigh mass resolving power of 1,000,000 at m/z 428.[2]

Acknowledgements

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References

[1] Marshall, A. G., *et al.*, Ann. Rev. Anal. Chem., **1**, 579-599 (2008)
[2] Xian, F., *et al.*, Anal. Chem., **84**, 708-719 (2012).