Optimization of a portable QMS for environmental monitoring

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The use of small portable MS instruments offers many advantages for environmental studies including in-situ detection and monitoring of stable and unstable isotopes in real time in field conditions. However the use of smaller instruments brings its own challenges of reduced sensitivity, resolution and stability. In this work we assess by 3D simulation the effect of the QMS pre-filter, electrode bias (pole bias) and ion source geometry on instrument resolution and stability. Of particular interest is the ion source to mass filter gap distance on ion coupling into the mass filter. The simulations are supported by experimental measurements on portable single filter, dual and triple filter QMS instruments. The focus of this combined approach is the instrument optimization so as to obtain the best possible performance in the smallest possible package. The application for this work is stable isotope analysis (including $\delta^{15}N$ and $\delta^{13}C$) for environmental monitoring (underwater and in ambient), for isotopic tracer measurements for biomedical investigations and for archaeological applications.

1. Effects of the source gap on transmission efficiency of a quadrupole mass spectrometer

Mariya J. Antony Joseph, David G. McIntosh, J. Raymond Gibson, and Stephen Taylor, Rapid Communcations in Mass Spectrometry, 32(9), pp. 677–685 (2018)