

Doing more with less: optimizing the Helix SFT for routine noble gas analysis of waters and gases

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The Helix-SFT mass spectrometer was designed for the simultaneous measurement of helium (He) isotopes, allowing for rapid, accurate acquisition of data. Though manufacture literature for the instrument lists measurement capabilities for argon (Ar) and a mass range of 1 to 150Da, little in the recent literature actually shows how to accomplish the measurement of xenon (Xe) and krypton (Kr) isotopes. At the USGS Noble Gas Laboratory we replaced an aging MAP-215-50 with a Helix SFT in July of 2016 and set out to replicate the measurement function according to laboratory SOP¹ which outlines the method for measurement of noble gas isotopes in dissolved gas samples. We found that the mass range for the Helix SFT at an operating acceleration reference voltage of 4.5KV (factory installation) was too small to measure Kr and Xe isotopes and decreased the voltage to 2.5 KV to resolve the Kr and Xe fractions at reasonable magnetic field voltages (~4.8 and 7 volts respectively). We raise it back to 4.5KV for measurement of Ar, Ne and He isotopes and utilize the instrument software to load two different source focusing settings associated with the varied accelerating field voltages. We were concerned with the amount of peak drift at low masses (He isotopes) due to the high variation of field voltages, but found little evidence that the measurements were affected. We also found that running at 800 μ A trap settings was not needed; running at 200 μ A gave us similar sensitivity for He as compared to sensitivities of the MAP-215-50 and has an added benefit of increasing filament life. The rapid change in source and magnet settings worked well but was also fairly cumbersome when run manually with the factory supplied software. We used the C# script editor feature of the factory software to enable a shareware, remote control server (RCS) that would allow for communication with the instrument control software. The RCS allows us to interface with the Helix SFT using LabView programming code. This combination of in-house LabView VI's and RCS allows for the manipulation of the instrument control software and automation of a complete noble gas analysis within a two hour window with an added bonus of allowing the user to change code to adjust for adverse timing and communication problems.

[1] Hunt, A.G.(2015), USGS Tech.and Meth., chp. A11, 22p.