

Supporting Information

Transmission mode desorption electrospray ionization (TM-DESI) for simultaneous analysis of potential inorganic and organic components of radiological dispersion devices

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Contained herein: TM-DESI mass spectra of salts, using CID (Figures S-1 through S-13). All spectra were acquired in positive mode except sodium iodide, which was acquired in negative mode. Calibration curves for cobalt and strontium, using cesium as an internal standard (Figure S-14). Spectrum for a mixture of the explosive RDX and cesium (Figure S-15) Spectra of oxidizer-cesium residue swabbed from surfaces (Figures S-16 through S-18).

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TM-DESI mass spectra of metal salts

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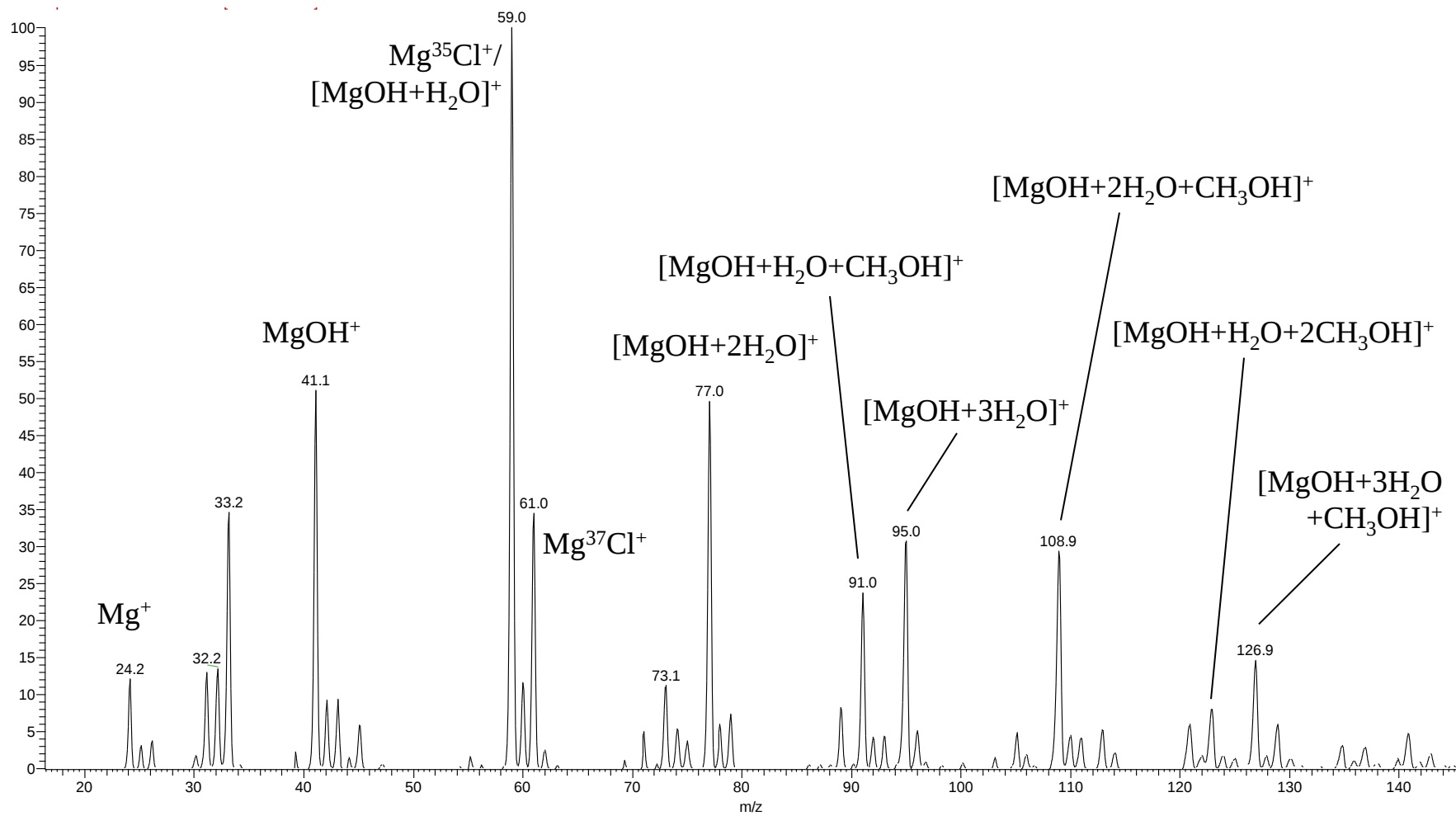


Figure S-1. Magnesium chloride

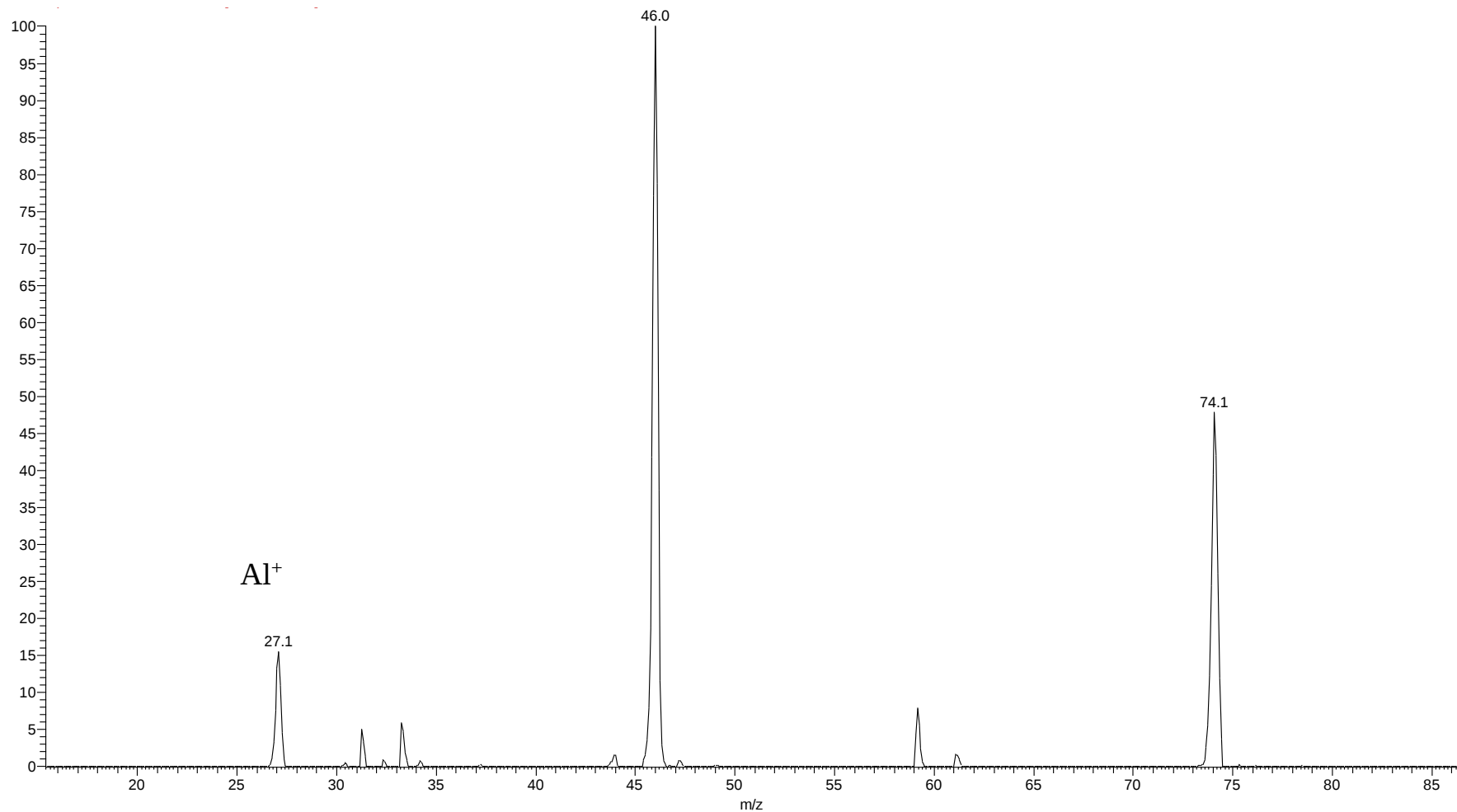


Figure S-2. Aluminum nitrate

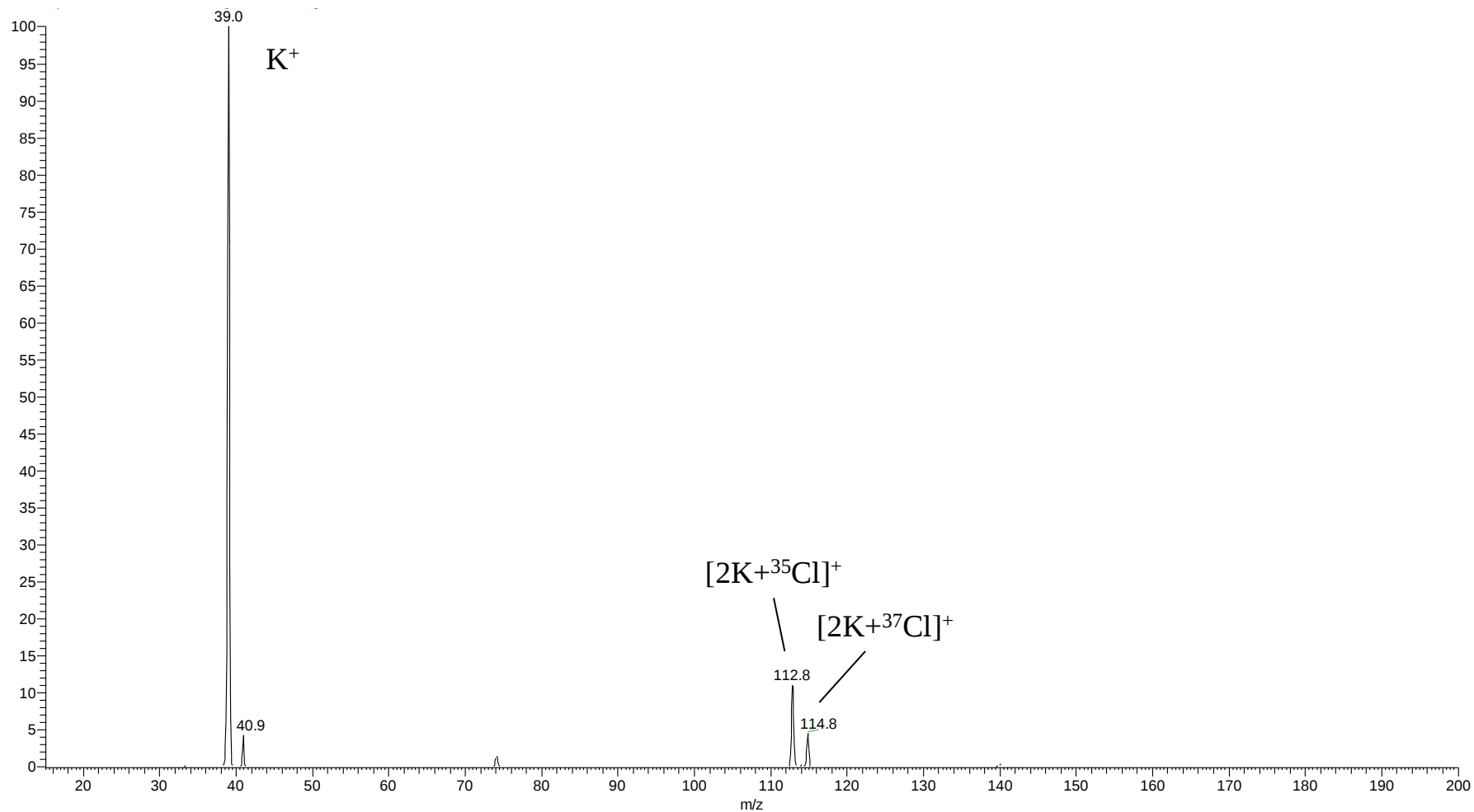


Figure S-3. Potassium chloride

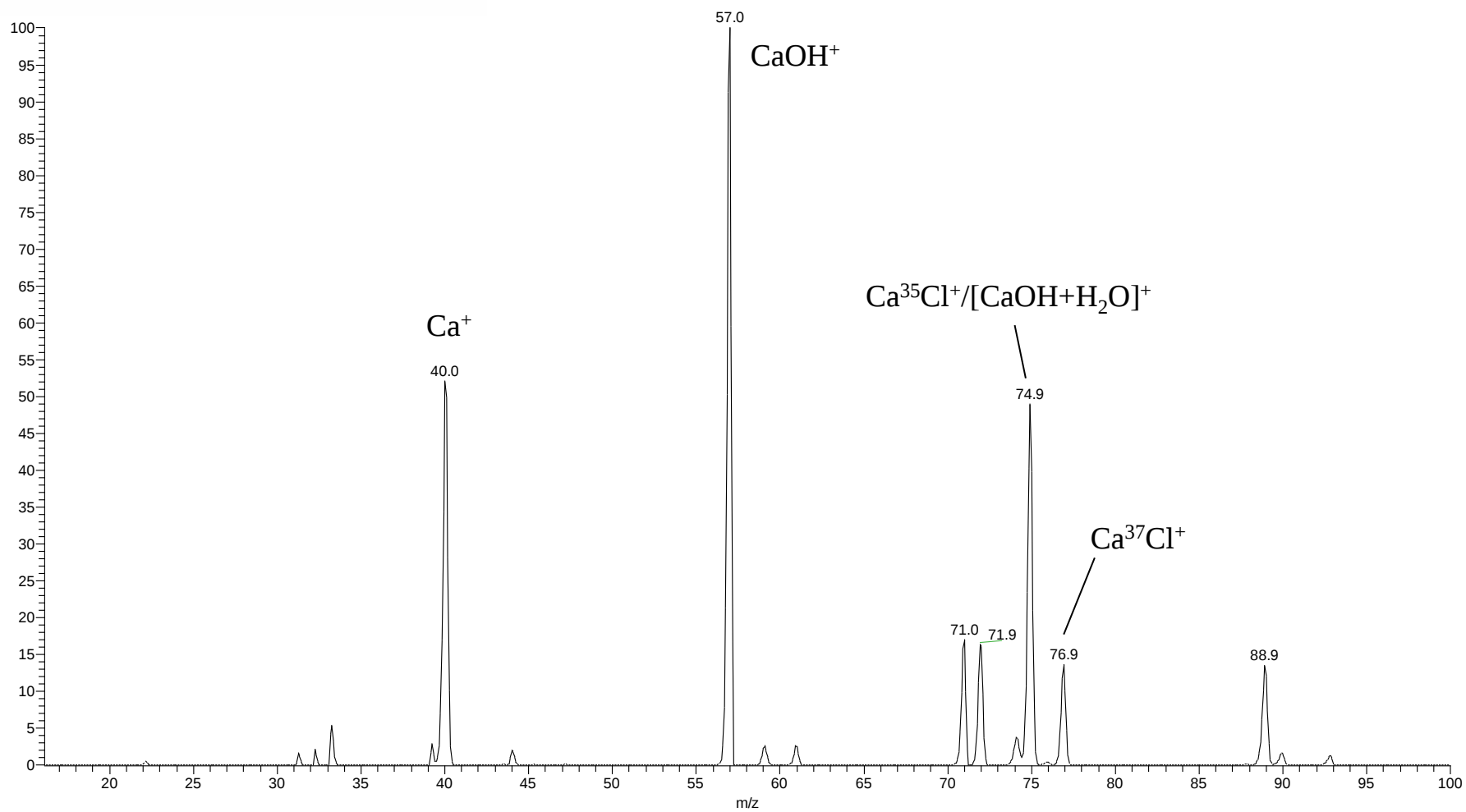


Figure S-4. Calcium chloride

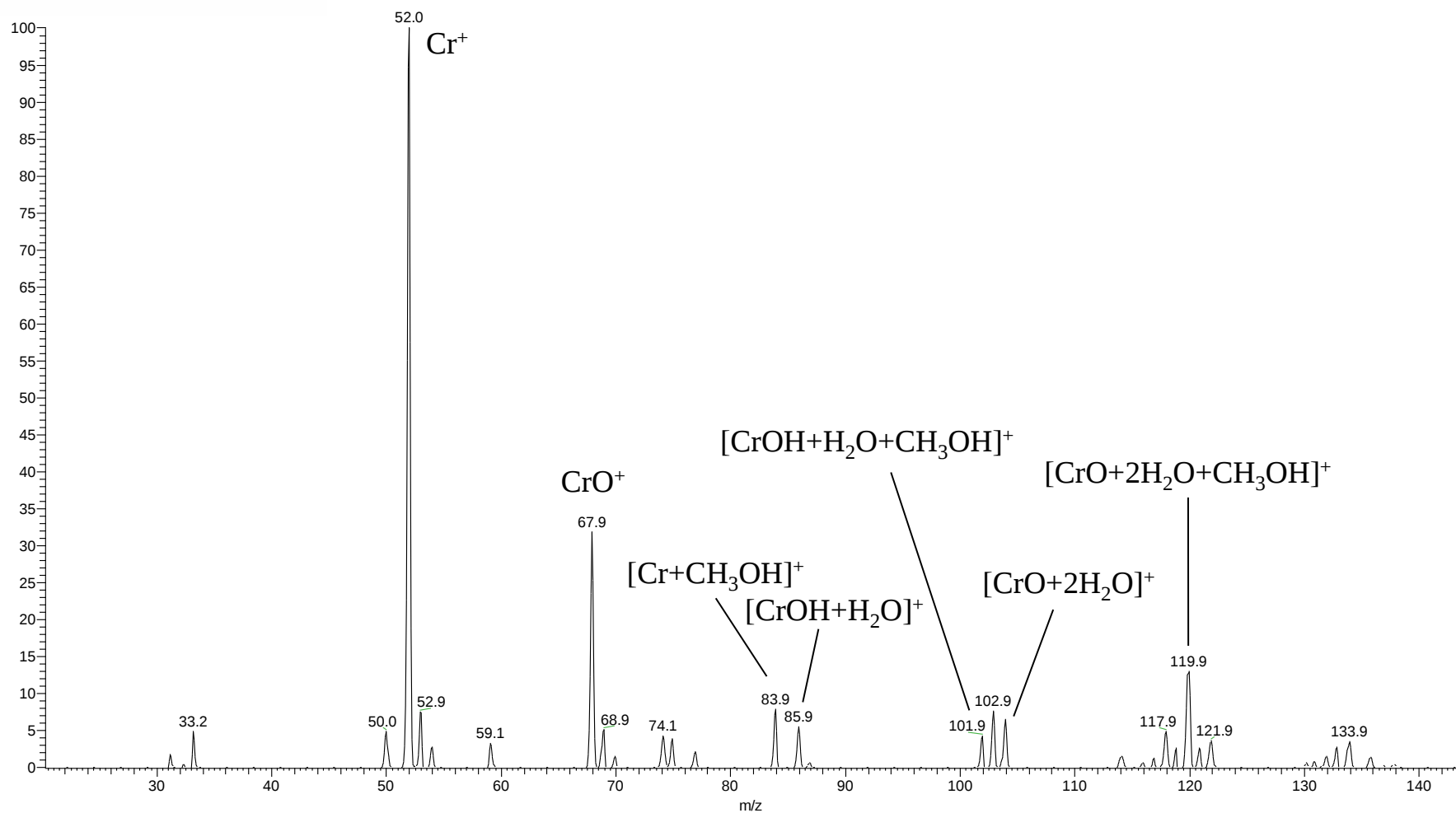


Figure S-5. Chromium chloride

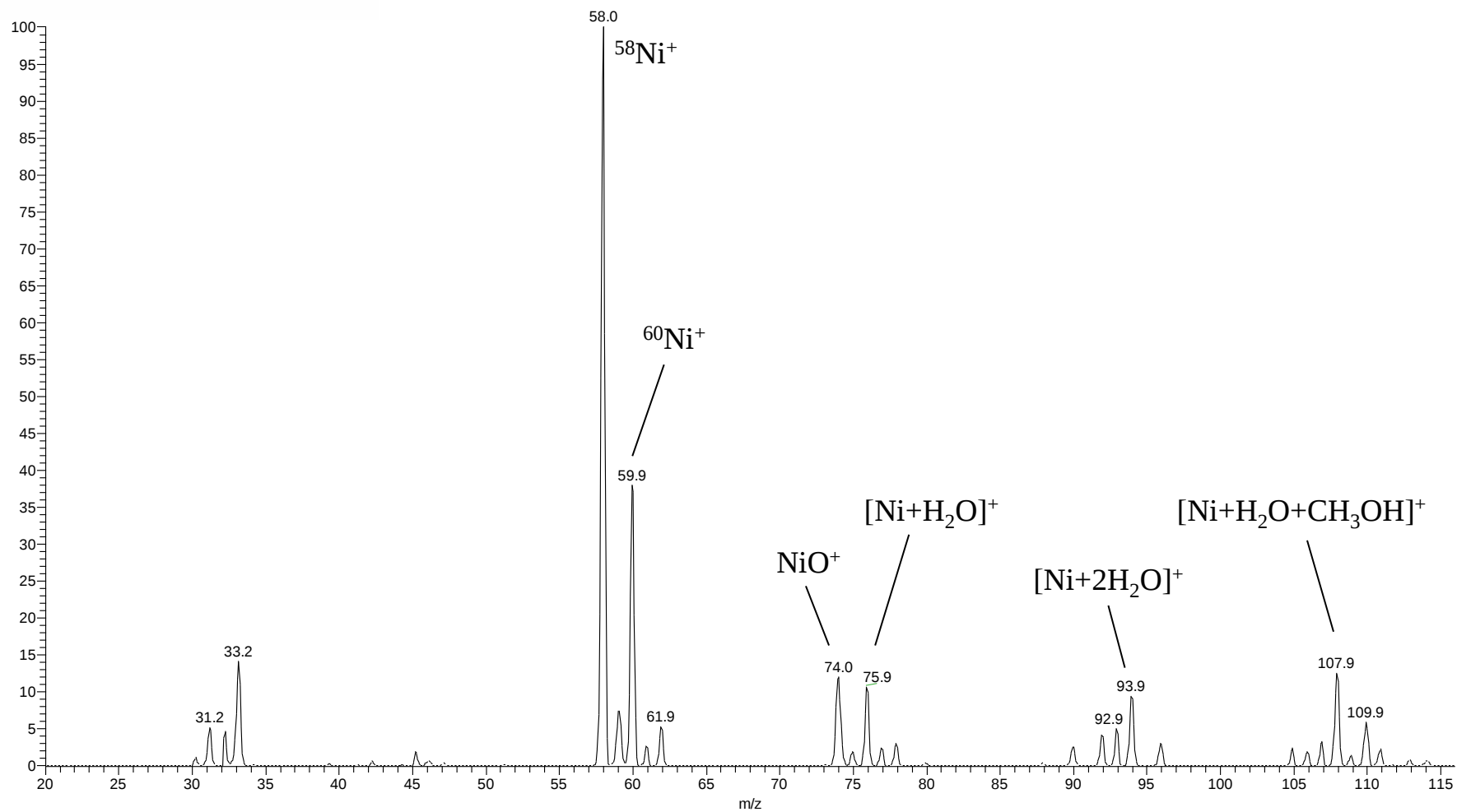


Figure S-6. Nickel nitrate

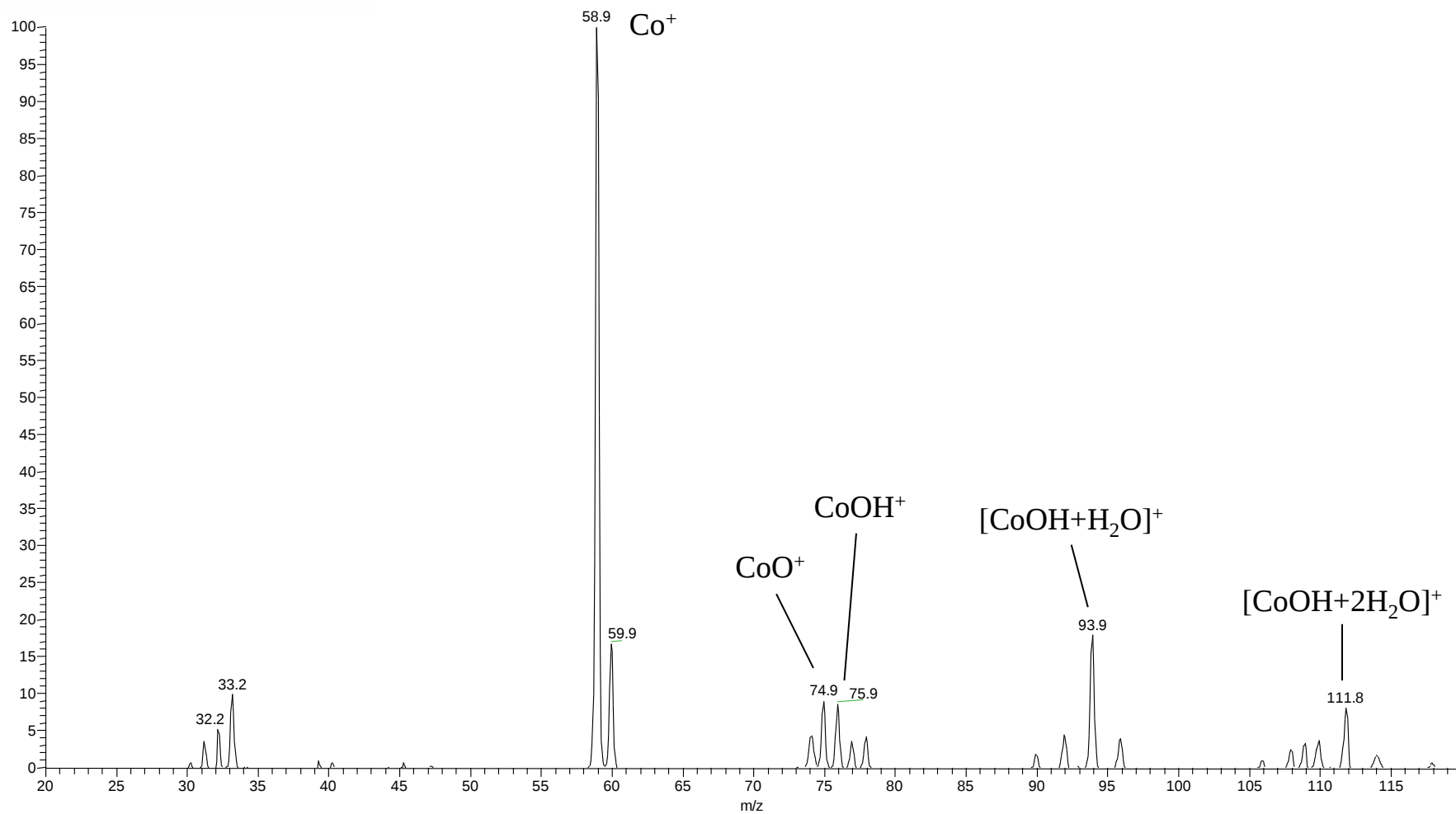


Figure S-7. Cobalt chloride

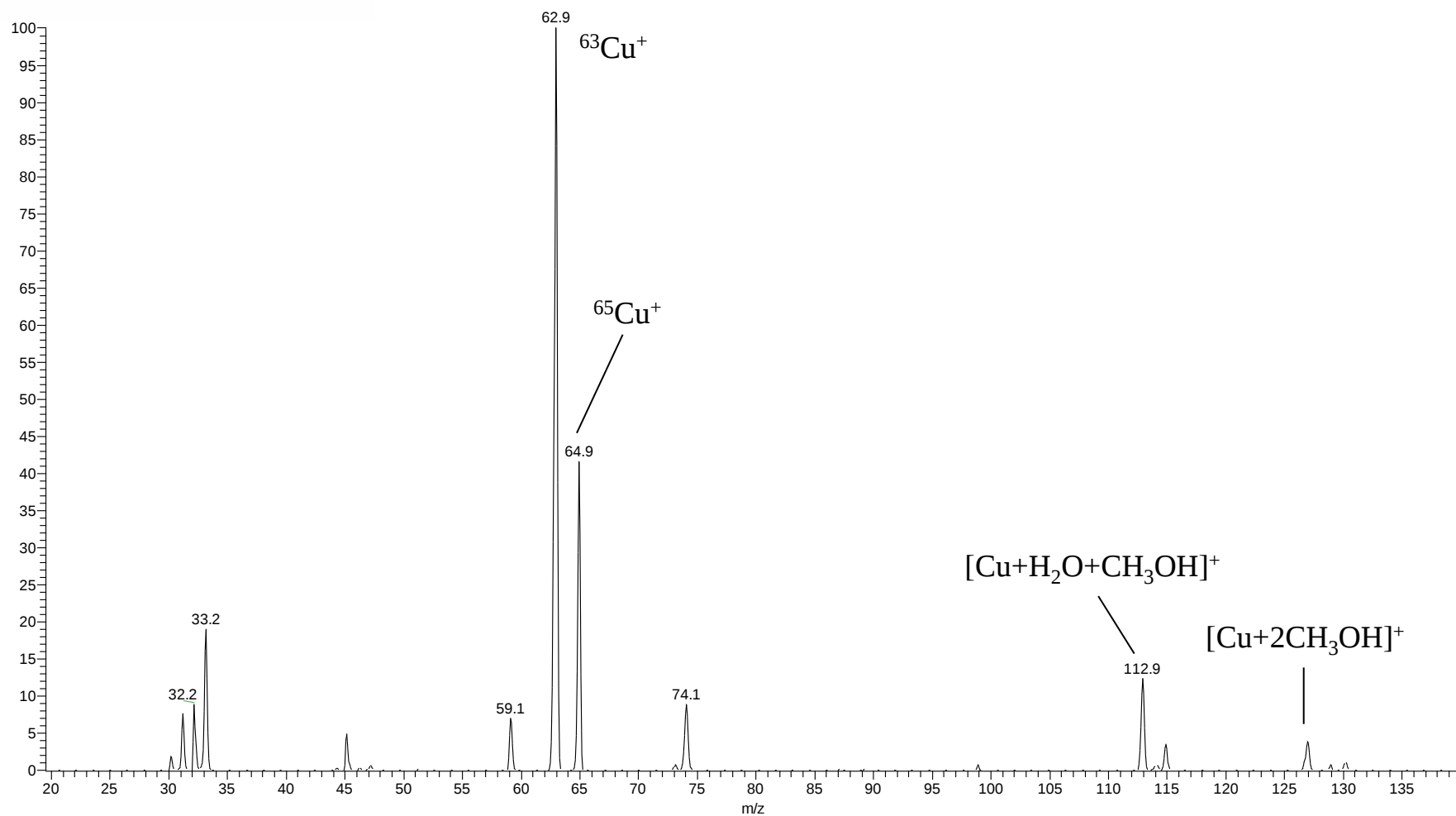


Figure S-8. Copper sulfate

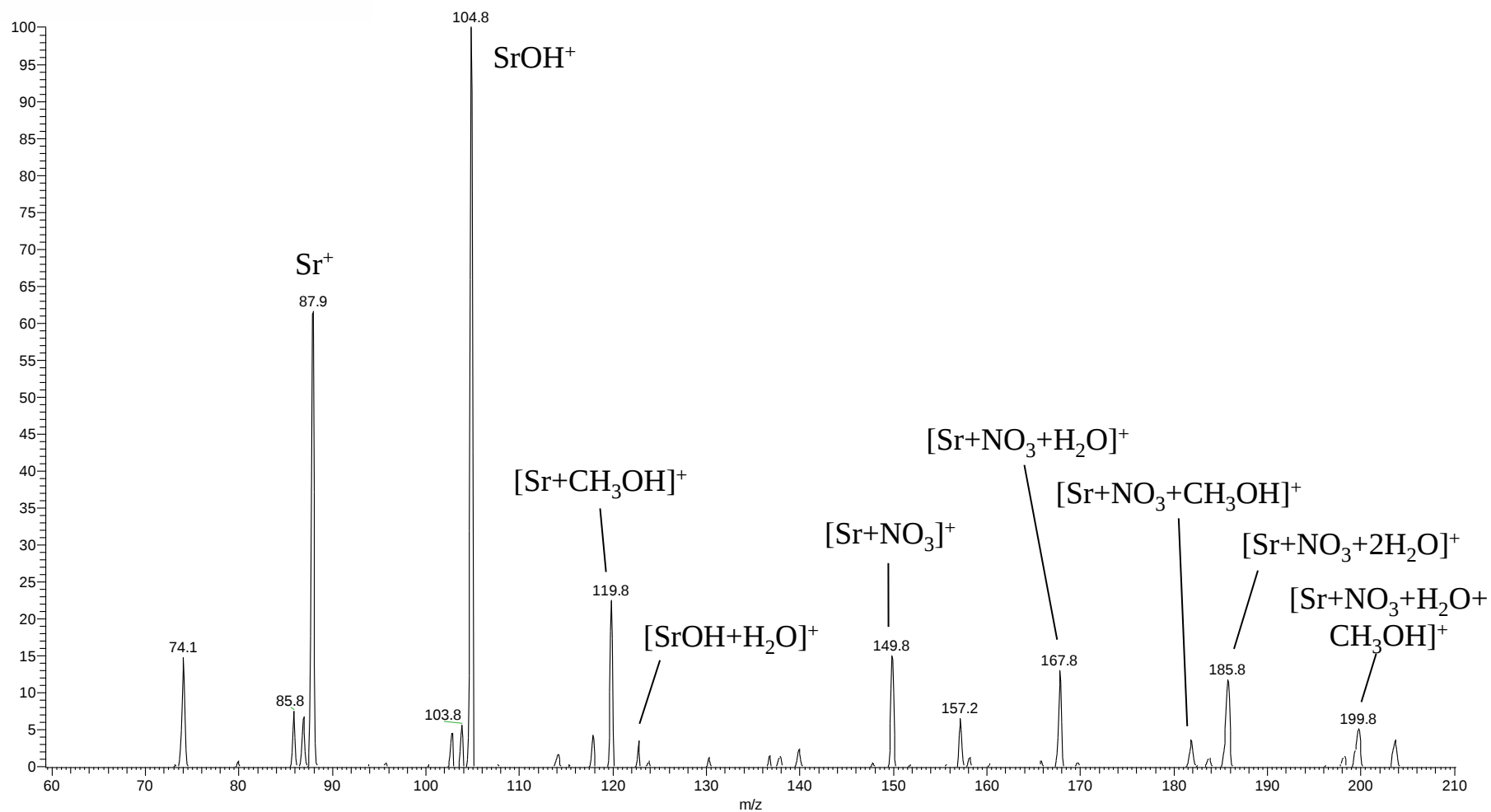


Figure S-9. Strontium nitrate

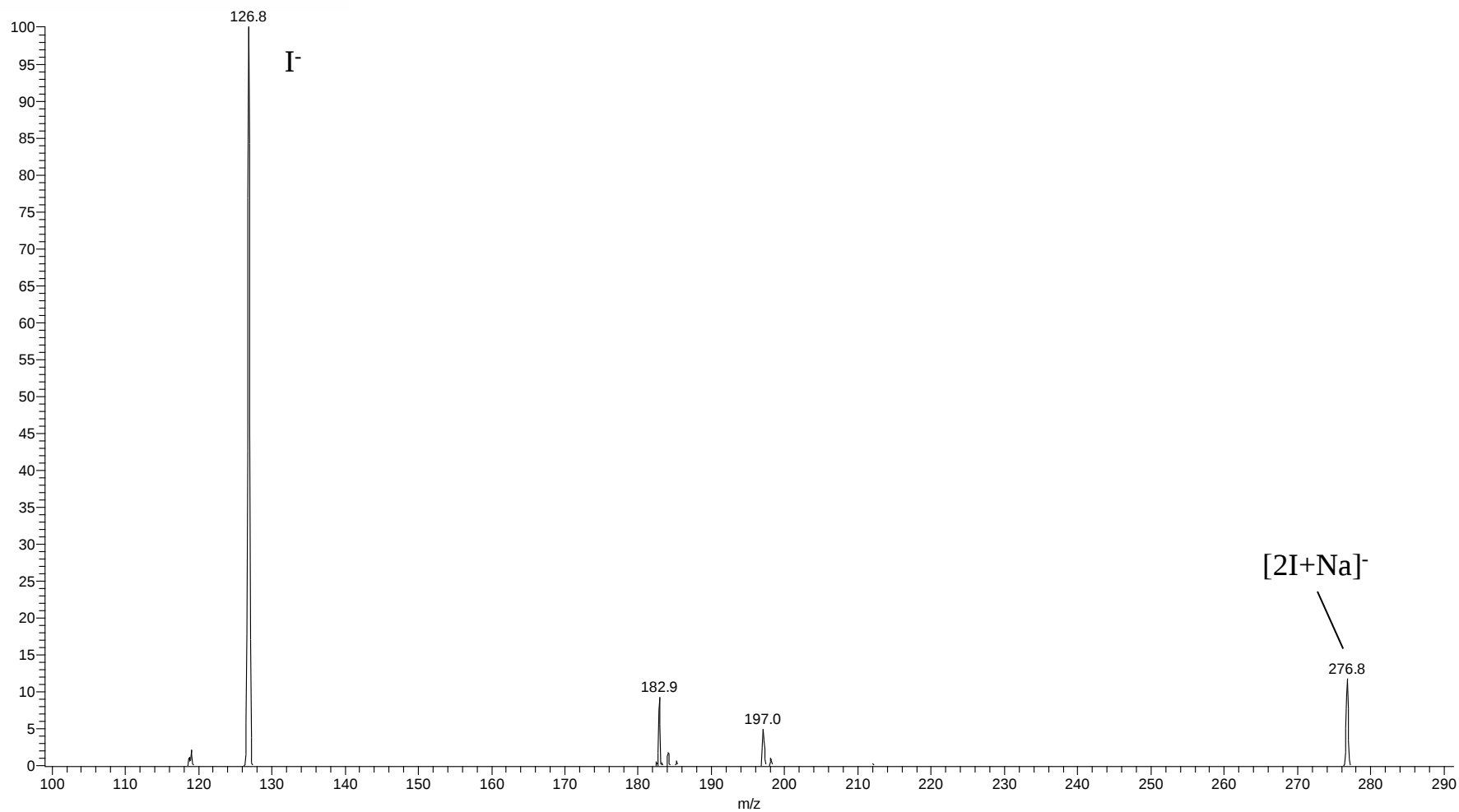


Figure S-10. Sodium iodide

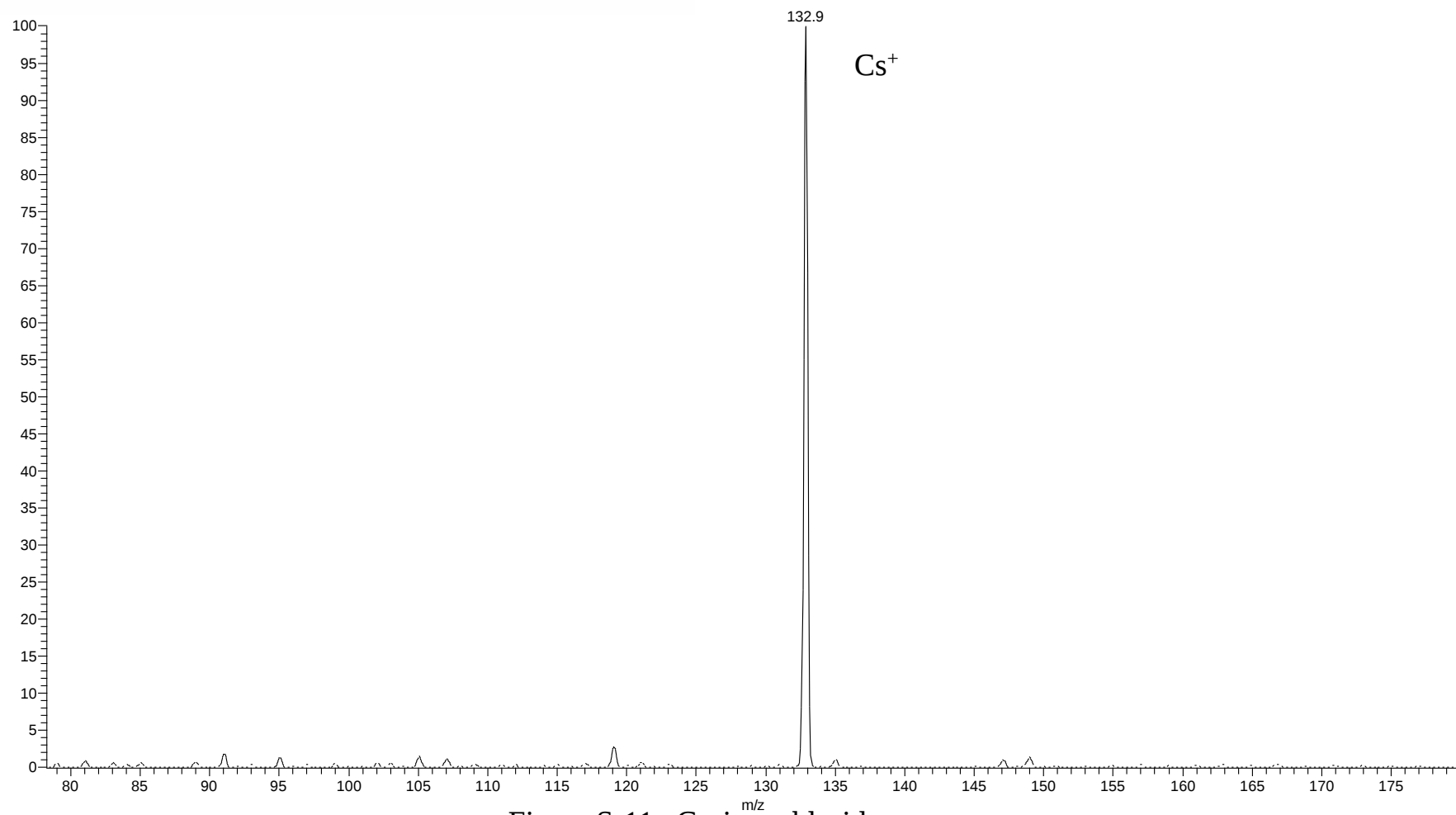


Figure S-11. Cesium chloride

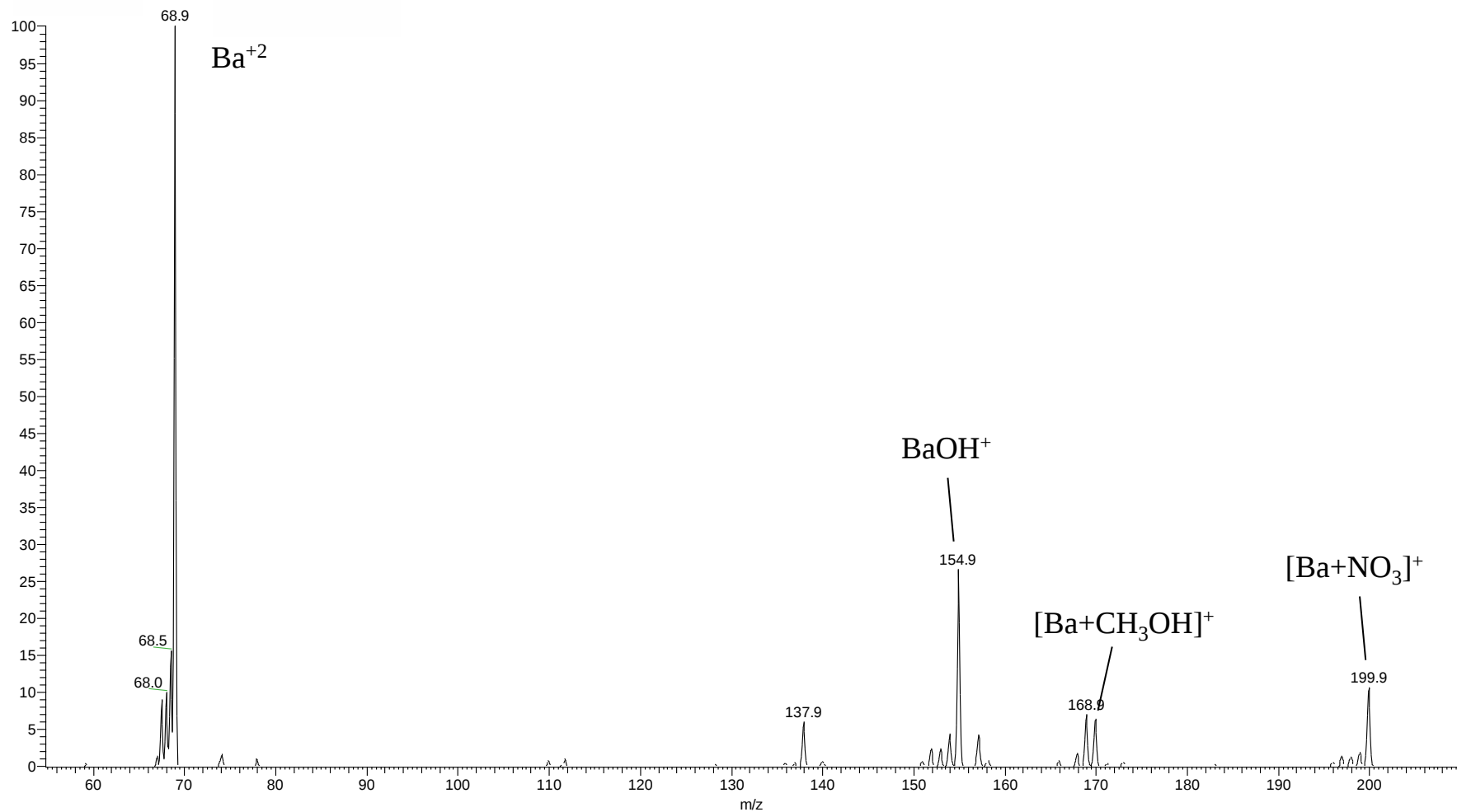


Figure S-12. Barium nitrate

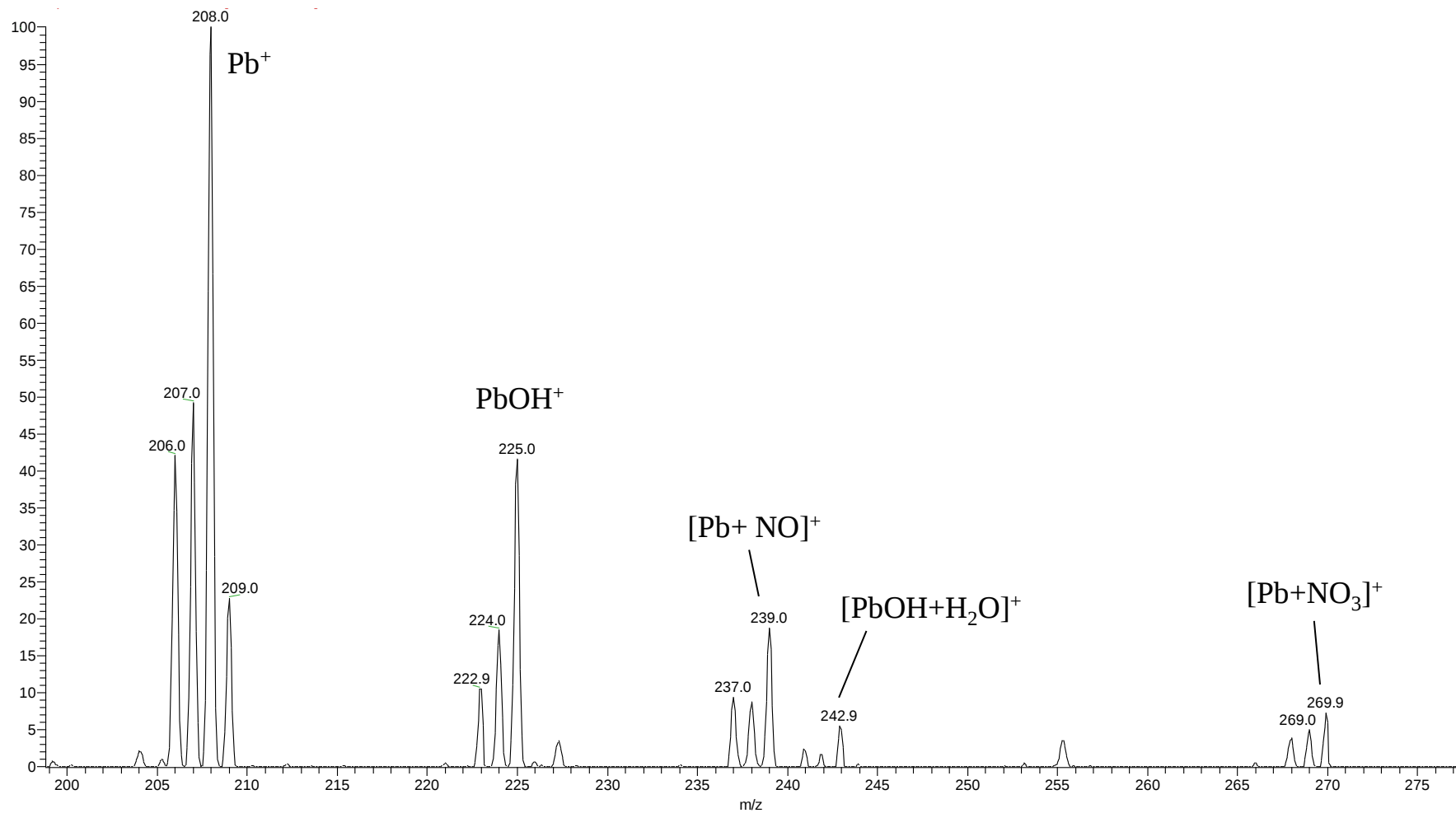


Figure S-13. Lead nitrate

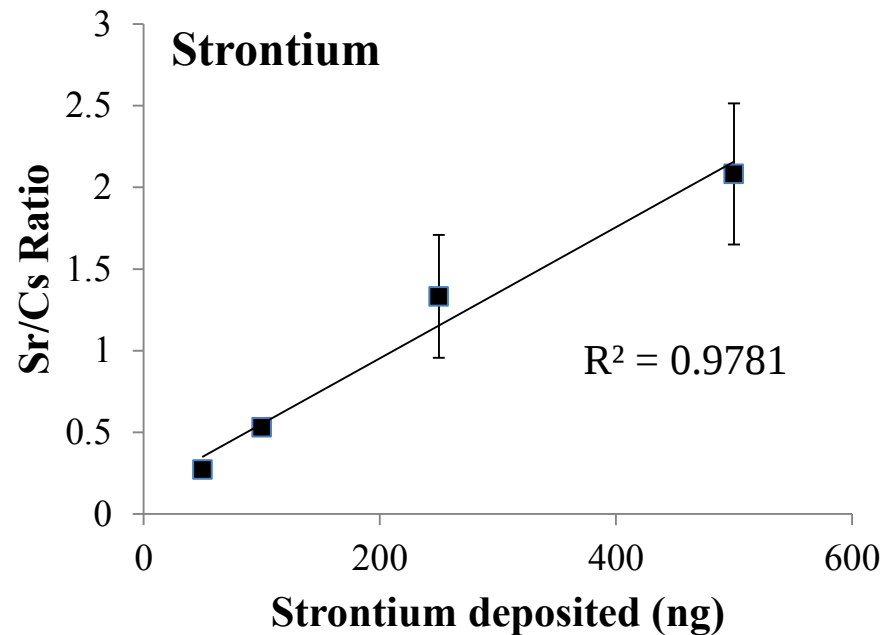
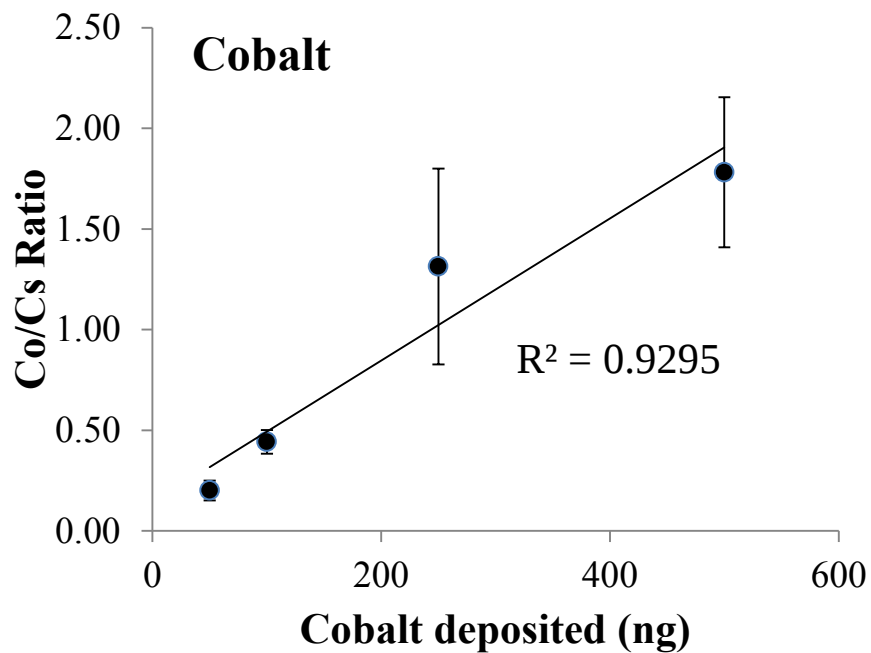


Figure S-14. Calibration curves for analysis of strontium and cobalt, using cesium as a pseudo-internal standard

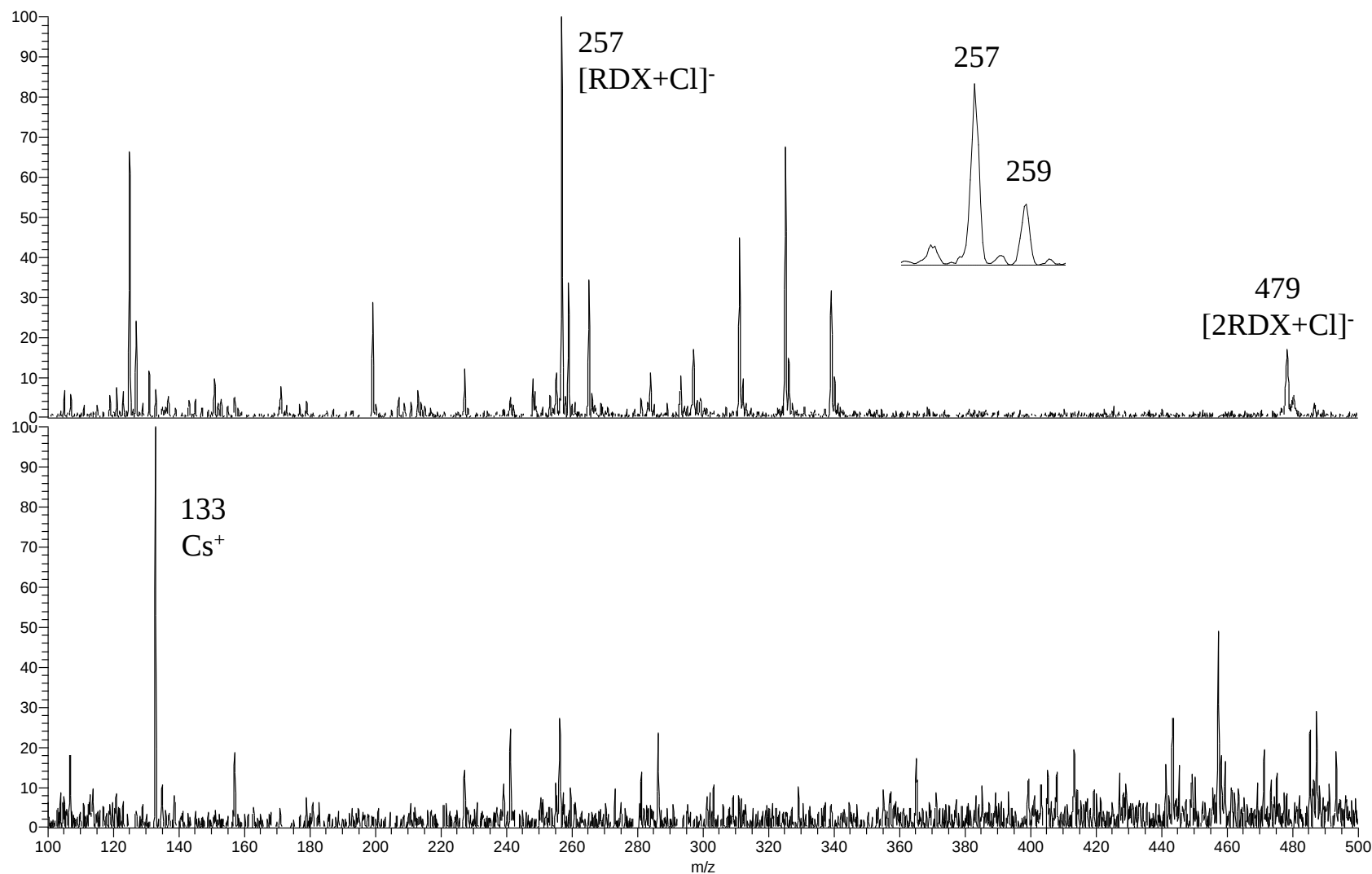


Figure S-15. TM-DESI spectrum of 100 ng CsCl and 1 μ g RDX, taken switching from negative mode (top) to positive mode with source CID (bottom). The components were dissolved in a solution of 3 mM NaCl before being spotted on the polypropylene mesh. While the sodium chloride can suppress the cesium signal to some degree due to competitive ionization of the sodium, the presence of additional chloride ion helps to form the RDX-chloride adduct and improves the RDX signal. The inset clearly shows the Cl isotope ratio for the RDX-chloride adduct, increasing the confidence in the peak assignment.

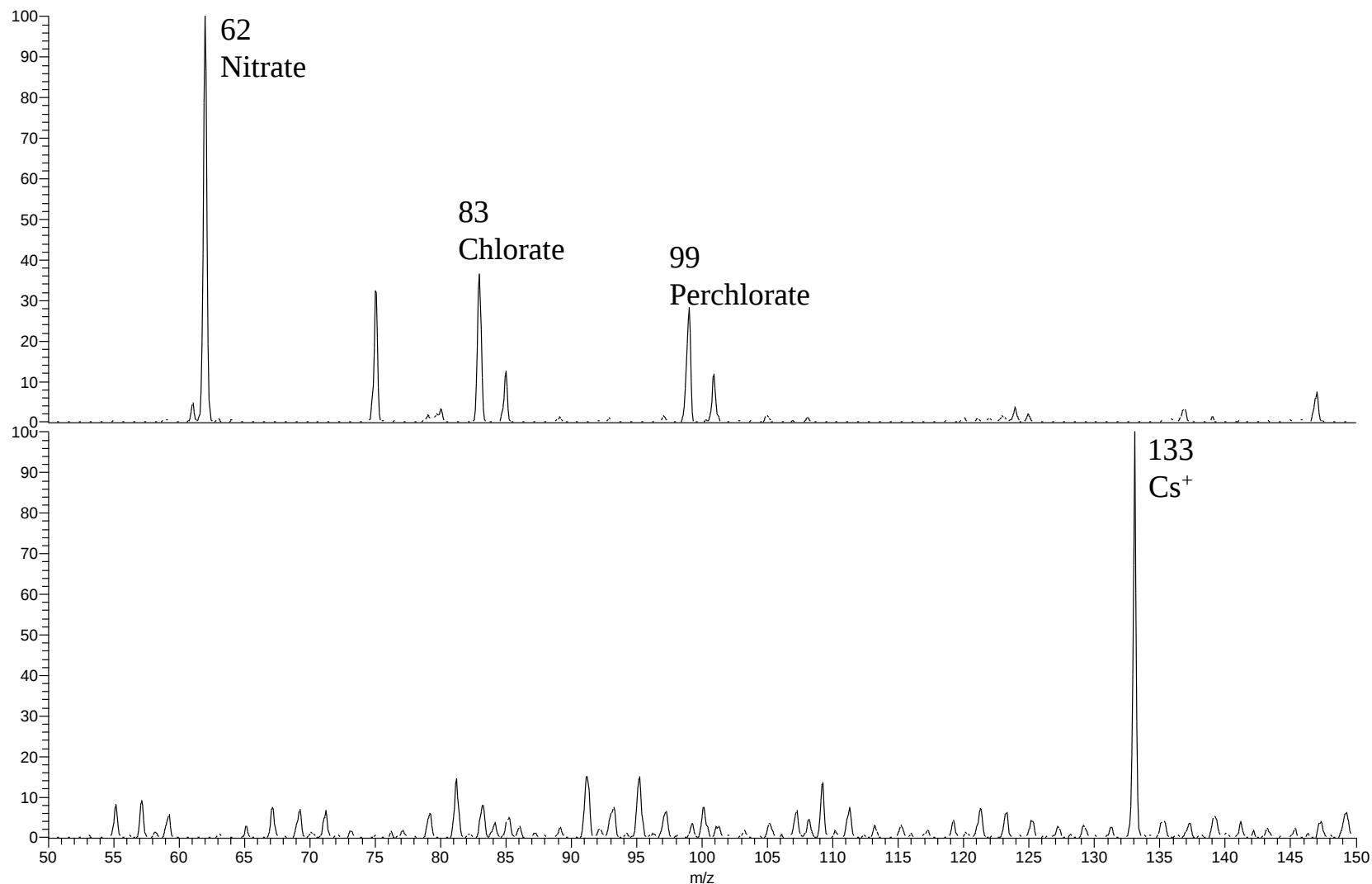


Figure S-16. TM-DESI spectrum for a polypropylene mesh used to swab a glass substrate with residue from an oxidizer-radionuclide simulant mixture, taken switching from negative mode (top) to positive mode with source CID (bottom). The mixture was composed of 500 $\mu\text{g/mL}$ SrCl_2 , 500 $\mu\text{g/mL}$ CoCl_2 , 100 $\mu\text{g/mL}$ CsCl , 25 $\mu\text{g/mL}$ NaClO_4 , 25 $\mu\text{g/mL}$ NaClO_3 , and 100 $\mu\text{g/mL}$ NH_4NO_3 . 40 μL of the mixture was deposited on a glass slide and allowed to dry before it was swabbed.

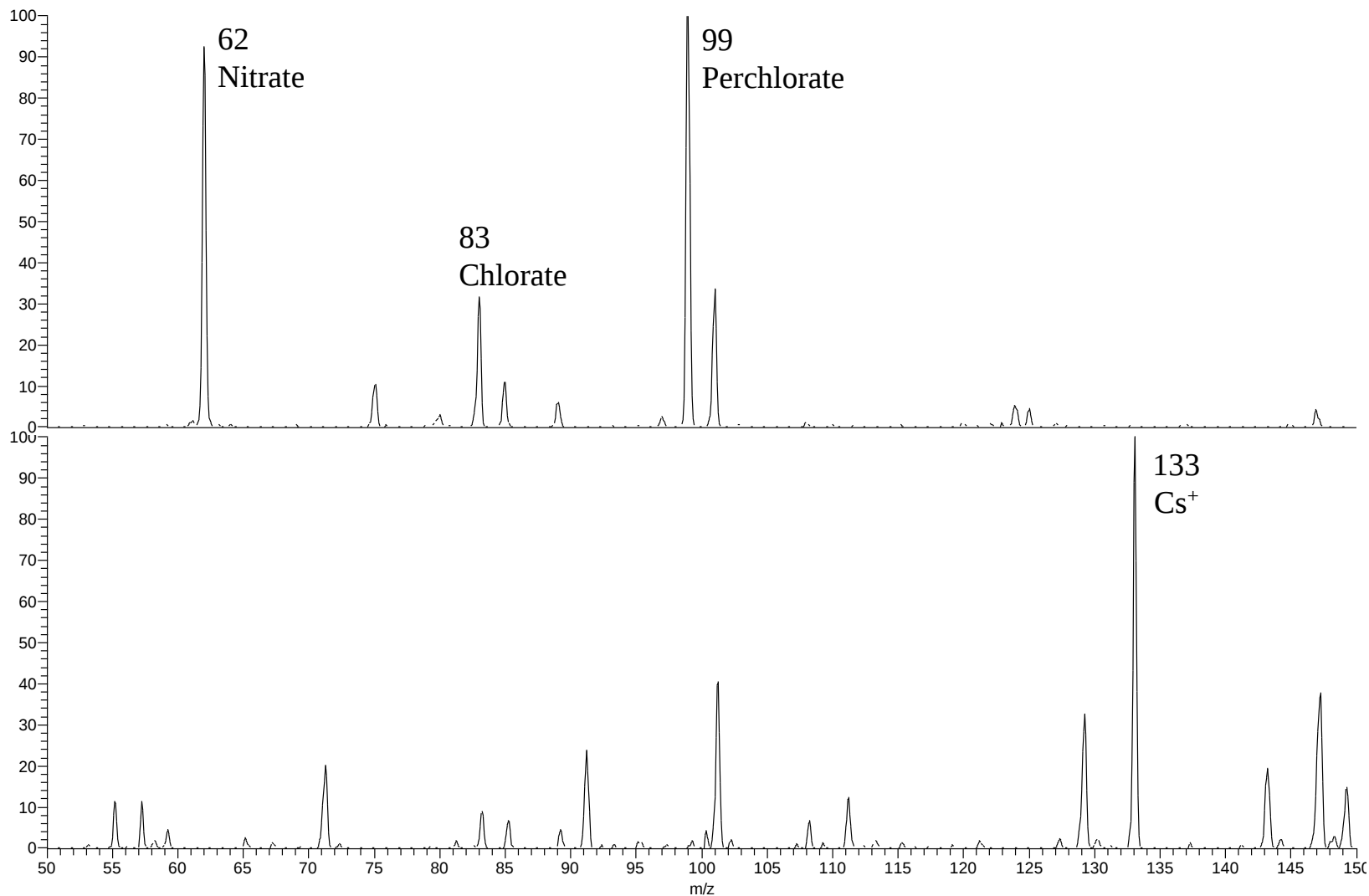


Figure S-17. TM-DESI spectrum for a polypropylene mesh used to swab the adhesive side of a piece of electrical tape, which had residue from an oxidizer-radionuclide simulant mixture, taken switching from negative mode (top) to positive mode with source CID (bottom). The solution used and conditions of the residue deposition are the same as described for Figure S-16.

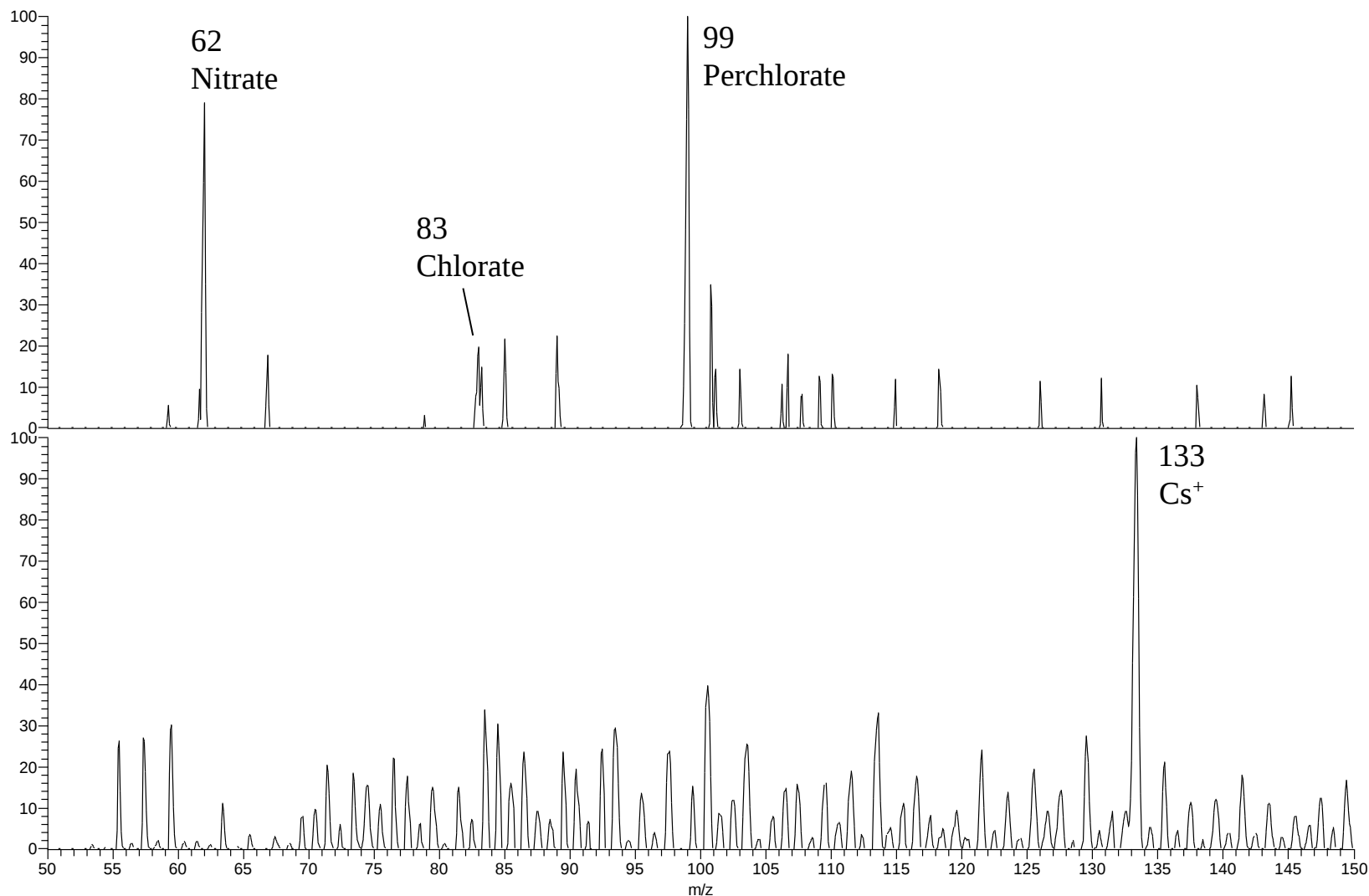


Figure S-18. TM-DESI spectrum for a polyurethane foam used to swab a glass substrate with residue from an oxidizer-radionuclide simulant mixture, taken switching from negative mode (top) to positive mode with source CID (bottom). The solution used and conditions of the residue deposition are the same as described for Figure S-16.