

Characterization of gas phase atomic cation reactivity with selected reagent gases in collision cell ICP-MS/MS analyses.

KALI MELBY¹, AMANDA D FRENCH², GREG EIDEN³, ERIC HOPPE¹, ISAAC ARNQUIST¹ AND DR. KHADOUJA HAROUAKA¹

¹PNNL

²Pacific Northwest National Laboratory

³Pacific Northwest National Lab

Presenting Author: kali.melby@pnnl.gov

Atomic MS/MS techniques allow for many analyte/interference separations, either through dissociative collisions, or through selective gas phase analyte or interferent product ion formation that effects a separation through a mass shift. These separations occur inline during the measurement, which results in quicker and more effective analyses. To determine useful reactions for inline separations in the instrument, a general idea of the reactivity of the incident ions with the reaction gas must be known. Product ion formation of ions over much of the periodic table have been explored with O₂, NH₃, H₂, CH₃F, N₂O, and H₂S using commercial ICP-MS/MS. We build on this body of work by exploring product ion formation with NF₃, OCS, and SF₆ using the Agilent 8900 triple quadrupole ICP-MS (QQQ-ICP-MS). We also compare our results with product ion formation collected with selective ion flow tube inductively coupled plasma mass spectrometry (SIFT-ICP-MS). In general, fewer cations were observed to form primary products (e.g., oxides, nitrides, hydrides) and favored higher order product formation (e.g., polyatomic species and ion-gas clusters). As the QQQ-ICP-MS operates at a higher ion kinetic energy regime than the SIFT-ICP-MS, it becomes apparent that ion-molecule reactivity must be studied under the non-thermal conditions of systems widely used for analytical measurements to identify what can be leveraged for method development.