Comparative experiment of gas mixing and signal smoothing devises for laser ablation-ICP mass spectrometry

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The performances of gas mixing device and signal smoothing devices for laser ablation-ICP mass spectrometry (LA-ICPMS) was evaluated in present study. In order to obtain properties of sample aerosols and gasses flow conditions for obtaining improved precision and short washout time, comparative experiment for sample transport system conducted. Devices on the sample transport tubing of LA-ICPMS are fell into categorized gas mixing devices (gas mixers) and signal smoothing devices (stabilizers). Four types of gas mixers, stainless steel Swagelock T-type tube fitting for 1/4 inches tube, PFA Y-type tube fitting, co-axial gas mixer and ESI gas mixer, and 5 types of signal smoothers, Noritake T3-17 static mixer, Younitech shardis Y-20A-8E static mixer, AMX-43X static mixer, buffled-type signal smoother and wire-type signal smoother were compared their signal signal intensities, signal stabilities and wash-out time. Directions of three ports of gas-mixers (Sample + He, Ar and exit to ICPMS) were also changed as horizontally and vertically (up and down).

T and Y type fitting gas mixers have similar washout time, but the Y type fitting gas mixer has generally not significantly wrong flow condition for the signal stabilities in either direction. The improvements of signal stabilities on the straight collision flow conditions are apparent on the co-axial and ESI gas mixers. The performances of five stabilizers tested in this study have each individual signal smoothing effects and washout times. All stabilizers provided improved signal stabilities compare to without stabilizer. Variation of signal stability and washout times using stabilizers had linear correlation with squared chamber volumes despite different inner structures.Total counts of U signal are not significant differences through the measurements for all gas mixers and stabilizers. This suggest the smoothed signals using stabilizer are not ascribable the rejection of large particle sample aerosols.