Multiple sulfur isotope analyses: Improvement and application to urban aerosols

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We report improvements for the simultaneous determination of multiple sulfur isotope compositions for both $\delta^{33}S$, $\delta^{34}S$ and $\delta^{36}S$ on the SF_6 molecule (m/z: 127, 128, 129, 131) for quantities down to 0.4 micromoles, and $\delta^{33}S$, $\delta^{34}S$ for quantities down to 20 nanomoles. Multiple analyses of two international Ag_2S standards, IAEA-S1 and IAEA-S3, yield a narrow range of $\delta^{34}S$ values vs CDT, with a standard deviation of ± 0.2‰. This ultimately allows the determination of the $\Delta^{33}S$ with an accuracy of ± 0.03‰ (1σ), $\Delta^{36}S$ from IAEA-S3 measurements still show larger variations with a standard deviation of ±1‰ (1σ).

This technique was applied to aerosols which are the main sources of urban pollution in order to better understand their formation conditions. Sulfur multi-isotope analysis of atmospheric emissions from the major S sources in the urban environment (road traffic, waste incinerators, heating, thermal plants and cement factories) shows that they can unambiguously be discriminated when their $\delta^{34}S$, $\Delta^{33}S$, and $\Delta^{36}S$ compositions are coupled.. We are currently analyzing PM_{10} (aerodynamical diameter <10μm) samples collected by the *Ville de Montreal* within the Montreal island since 1969 at 6 stations typical of distinct environments including road traffic, harbor, downtown, and natural background to elucidate the isotope shift associated with secondary aerosol formation process.