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Determination of ultra-trace sulfur in high-purity metals by isotope dilution inductively coupled plasma sector field mass spectrometry combined with chemical separation procedure

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Abstract

The analytical method of ultra-trace sulfur (S) in high-purity metal by isotope dilution inductively coupled plasma mass spectrometry (ID-ICP-MS) combined with chemical separation procedure was developed in the present study. In order to determine the ultra-trace S in high-purity metal, a chemical separation with alumina column was carried out before ICP-MS measurement. This method enabled to prevent the polyatomic ion interference arising from the metal matrix and the signal suppression derived from the space charge effect in ICP-MS. In order to achieve high sensitive analysis, an ICP-sector field mass spectrometer (ICP-SFMS) was used. The isolation of polyatomic ion interference with respect to S was also carried out in medium-resolution mode. In addition, measurement conditions including detector dead time, which affects the precision and accuracy of the isotope dilution method, and washout conditions that were employed to reduce memory effects were optimized. The developed method was validated by the determination of S in a high-purity iron reference material (JSS-001-4). The analytical result obtained by the developed method ($1.86 \text{ mg kg}^{-1} \pm 0.12 \text{ mg kg}^{-1}$

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