Accurate analysis of lithium isotopes using MC-ICP-MS by a novel method of reducing memory effect

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The feasibility of accurate analysis of Li isotopic ratios by MC-ICP-MS is traditionally hampered by strong memory effect of Li. Here, a novel method of reducing memory effect of Li was developed. We found that Li blank of 2% HNO_3 can be magically reduced by a factor of 50 - 70 by the addition of a 5% NaCl rinse step. The "mismatching effects" caused by different acid and Li concentrations between the sample and standard reported previously were eliminated on the condition that the Li blank was efficiently reduced, which means that the essence of the two kinds of matrix effects is memory effect. Our experiments demonstrate that both the sample type and Li mass load can influence the elution process for chemical purification of Li. It is thus suggested to keep the Li mass loaded on the resin identical and reasonably broaden the elution interval (9 - 26 ml used in this work) to guarantee the 100% recovery of Li for different sample types. Applying the single-step column process and blank reducing technique using NaCl solution, a method without strict matrix-matching was developed for accurately and precisely analyzing Li isotopic ratios. Analyses of 8 reference materials including rock, seawater and Li-carbonate agree well with the recommended values within the uncertainty but give generally improved precision. The external precision of our method is better than ± 0.25‰ (2SD) for δ^7Li, which is good enough for us to identify the slight fractionation of Li isotopes during the geological process.