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The origin of isotope fractionation in multi-collector inductively-coupled-plasma mass-spectrometer: a case study of Mg isotope fractionation ZHENGRONG WANG, DEQUAN XIAO, Yale University, XI SHAO, University of Maryland, College Park — Mg isotope fractionation in multi-collector inductively-coupled-plasma mass-spectrometer (MC-ICP-MS, Neptune) has been systematically investigated on a standard solution as a function of radio-frequency (RF) power, radius of skimmer cone orifice, Ar gas flow rate (sample and auxiliary gas), and voltage on extraction lens. Our experiments show that 26Mg/24Mg and 25Mg/24Mg ratios measured by Neptune are higher than their true ones by hundreds of per mil. This fractionation could be significantly reduced by decreasing RF-power, increasing radius of skimmer cone orifice, and increasing the Ar-gas flow rate (more so for sample gas than for auxiliary gas). However, voltage of extraction lens has little effect on the fractionation. Our results suggest the plasma gas expansion and collision of ions between sample and skimmer cone is another mechanism for isotope fractionation that can better explain our experimental experiments. A qualitative model and a numerical simulation are presented in this study. The numerical simulation, based on plasma/ion dynamics, provides a detailed picture of the process. Our study proposes an alternative mechanism for the origin of isotope fractionation in Neptune, and improves analytical precisions for studying non-traditional metal isotopes.

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