

Investigating Cr isotopes to establish a timeline for moderately volatile elements loss in terrestrial planetary material

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Many terrestrial planetary bodies are significantly depleted in moderately volatile elements compared to chondrites¹. It is debated whether this relative depletion originated from fractionation between vapour and dust in the Solar nebula, or whether it occurred as part of the growth process of planetary bodies by volatilisation from the surface of planetary objects^{2,3}. The relatively high Cr isotope ratio in samples from the eucrite parent body has been linked specifically to fractionation during volatile loss on planetesimals instead of in the Solar nebula⁴, because Cr isotopes uniquely fractionate in opposite sense during vapour-condensate interaction at the higher oxygen fugacities on planetary surfaces compared to a nebular setting.

Observations⁵ and modelling⁶ suggest that planetary accretion occurred in less than 6-7Ma. With a half-life of 3.7Ma, the extinct Mn-Cr system could be optimal to investigate the timing of volatile loss, but previous work has presented opposing views on the use of Cr isotopes for this purpose^{7,8}. More work is therefore required to further investigate this issue.

In this work, we aim at analysing Cr isotope ratios to assess their application to obtain Mn-Cr ages for extraterrestrial material, potentially establishing a timeline of the discussed volatile depletion. We investigate the use of cation exchange resin for efficient purification of the Cr fraction. Samples are analyzed both on Triton TIMS using high-purity Re filaments and on Neptune MC-ICPMS to evaluate the best-adapted solution for high-precision data production

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