Investigation of Ga and Cd isotope fractionation during evaporation and re-condensation

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The role of evaporation and/or condensation during the formation of solar system materials can be investigated by volatile element stable isotope analysis. For a better understanding of related isotope fractionation effects, combined evaporation/condensation experiments were conducted under atmospheric pressure at variable fO_2 in air and CO-CO_2. Samples include silicate melt residues from evaporation and condensates leached from Al_2O_3 plates at the top of the oven.
A moderate suppression of isotope fractionation is observed for the evaporation of Cd into air and for Ga into CO-CO_2. A much stronger suppression of Cd isotope fractionation is observed in CO-CO_2. Cadmium condensed at higher temperatures in air than in CO-CO_2. As expected from kinetic theory, light isotopes are enriched in the condensates relative to the vapor. Hence the light Cd isotopes are enriched at the hotter regions closer to the melt surface and the isotope composition of the condensates become progressively heavier with distance to the melt.