# Ru stable isotope analyses of meteorites by double spike MC-ICPMS

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The abundances of highly siderophile elements (HSE) in the primitive upper mantle of the Earth are higher than those expected for equilibrium metal-silicate partitioning during core formation in Earth (e.g. [1]). This HSE excess is commonly explained by the addition of a late veneer of primitive material to the Earth's mantle after core fomation was complete [e.g. 2]. However, non-chondritic relative abundances of Pd and Ru in the Earth's mantle indicate that either the late veneer was comprised of material distinct from known groups of chondrites (e.g. [1] [3]) or represents a mixture of chondritic and differentiated meteoritic material [4]. Alternatively, the mantle abundances of some HSE are at least partly influenced by metal-silicate equilibration at high temperatures and pressures [e.g. 5]. For instance, the concentrations of Au, Pt and Pd can be explained by high PT core formation (e.g. [5-7]). To distinguish between the addition of a late veneer and high-PT metal-silicate partitioning during core formation as the dominant processes establishing HSE abundances, the investigation of stable isotope fractionations in HSE are useful. This is because metal-silicate equilibration of HSE should impart a strong isotope fractionation in the silicate, due to the very strong affinity of HSE for metal.

We have developed a new $^{98}$Ru-$^{101}$Ru double spike for the precise measurement of small mass-dependent Ru isotope variations in meteorites and terrestrial samples. The isotope measurements were conducted using the Neptune *Plus* MC-ICPMS at the University of Münster, and the data reduction is made off-line using the double spike toolbox [8]. Our first preliminary results show that carbonaceous and ordinary chondrites as well as IIIAB iron meteorites are isotopically fractionated compared to an Alfa Aeasar Ru standard solution. There also is a hint of small Ru stable isotope variations among the investigated meteorites, but these differences are small and not yet clearly resolved and need further investigation through the analyses of a more comprehensive set of samples.

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