Ruthenium isotope anomalies in meteorites and their role as genetic tracers during planetary accretion

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Nucleosynthetic isotope anomalies represent small mass-independent deviations in the isotopic composition of meteorites or their components relative to that of the terrestrial mantle. They arise from the heterogeneous distribution and/or selective processing of pre-solar phases in the protoplanetary disk. High-precision Ru isotope data obtained for primitive and differentiated meteorites, acid leachates and insoluble residues show that, compared to the Earth's mantle, *all* analyzed bulk meteorites display variable deficits in *s*-process Ru nuclides [1,2]. Moreover, among primitive meteorites, Ru isotope anomalies increase in the order of enstatite<ordinary<carbonaceous, demonstrating that volatile-rich material formed at greater heliocentric distance is characterized by larger Ru isotope anomalies. Hence, Ru isotope anomalies have the potential to fingerprint the type and volatile content of materials that contributed to the terrestrial planets at different stages of their accretion [2,3] and to trace the dispersion of materials from distinct nebular reservoirs in numerical simulations of planetary growth [4]. Therefore, Ru isotopes are a versatile tool to investigate the nucleosynthetic heritage of solar system materials, to assess mixing in the protoplanetary disk, and to establish genetic links between primitive building blocks and differentiated planetary bodies.

[1] Fischer-Gödde et al. (2015) *GCA* **168**, 151-171. [2] Fischer-Gödde and Kleine (2017) *Nature* **541**, 525-527. [3] Dauphas (2017) *Nature* **541**, 521-524. [4] Fischer et al. (2018) *EPSL* **482**, 105-114.