Experimental Germanium isotopic fractionation under HT, fO_2-controlled conditions of core formation and accretion

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Terrestrial planets and the Moon underwent metal-silicate differentiation in their earliest history under reducing conditions. This process partly explained the depletion in siderophile (iron-loving) and volatile elements with respect to the solar composition (i.e. CI chondrites) in their silicate reservoir. Metal-silicate experiments and models of pressure, temperature, and increasingly oxidized conditions pertinent to the end of accretion fail to reproduce the Earth's mantle germanium (Ge) concentration, a moderately siderophile and volatile element, unless unrealistically high amounts of chondritic "late veneer" is added to the silicate reservoir [1].

In order to understand the specific behaviour of germanium and its isotopes under the T, fO_2 conditions of core formation and accretion processes, we have undertaken a series of metal-silicate experiments. The silicate phase of 1bar anorthite - diopside eutectic doped with ~4000 ppm of Ge-Aldrich standard is placed in pure Ni capsules at 1 atm in a vertical drop quench furnace, at T= 1355°C for 2 to 60 hours over a range of fO_2 from 4 log units below, to 2.5 log units above, the IW buffer [2]. Ge isotope data on metal phase were given in [2]. New Ge isotopic analyses of the final low-Ge silicate have been performed using hydride generator system coupled to the Neptune*Plus* MC-ICPMS (CRPG-Nancy) [3].

At very low fO_2, *Ge diffusion* in the metal was observed ($\delta^{74/70}Ge_{metal}$ slightly lower that Ge-CMAS starting material). Under increasingly oxidizing conditions, competition was seen between *diffusivity and volatility* (strong increase in $\delta^{74/70}Ge$ in metal and silicate associated to a decrease in Ge contents). With time, it is shown an inversion of $\Delta^{74/70}Ge_{metal-silicate}$, from negative to positive. These results are consistent with the sense of Ge isotopic fractionation as seen in metal and silicate phases of pallasites and chondrites [4, 5], and between Fe-meteorites and the silicate Earth [3].

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