Xenon in Archean barite

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The isotopic composition of xenon has been measured on 3.5 Ga barite of the Dresser Formation, Pilbara, Western Australia. The sample analyzed was collected at about 86 m depth from a diamond drill core (Pilbara Drilling Project). The fact that the sample has been shielded from modern cosmic ray exposure reduces the number of potentially interfering production pathways, simplifying interpretation of the Xe isotope spectrum which is clearly distinct from that of either modern or ancient atmospheric Xe. A strong excess of ^{130}Xe can be identified, as well as other isotopic excursions which can be attributed to either mass dependent isotopic fractionation and contributions from products of uranium fission. The mass-dependent fractionation, estimated at 2.09% amu^{-1}, can be accounted for by mutual and/or thermal diffusion and Rayleigh distillation during barite precipitation ([1] and references therein). This fractionation needs the intervention of a gaseous phase, as Foriel *et al.* [2] propose. The other deposition process frequently proposed for these barite formation is initial deposition of anhydrite followed by replacement of Ca^{++} (in the anhydrite) by Ba^{++} [3]. However, it seems unlikely that this process could create a non negligible mass fractionation geological constraints. After correction for mass dependent fractionation, the concentrations of fissiogenic Xe isotopes demonstrate that the U-Xe isotope system has remained closed over 3.5 Ga. From the excess of ^{130}Ba, the 2EC half-life of this isotope is estimated at $6.47 \pm 1.21 \times 10^{20}$ yr.

[1] Marty (1984) *Geochemical Journal* **18**, 157-162. [2] Foriel *et al.* (2004) *EPSL* **228** (3-4) 451-463. [3] Buick R. and Dunlop JSR. (1990) *Sed.*. **37**(2), 247-277.

OH partitioning coefficient between garnets and melt inclusions in lherzolite xenoliths from the Kimberly diamond mine, South Africa (UNESCO IGCP 557)

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An important feature in diamond exploration is to understand the mechanism of the kimberlite eruption. The dynamics of kimberlites strongly depends on the composition of the kimberlitic melt. Kimberlitic magmas contain a higher concentration of water than lamporitic magmas. This water is found in hydrous minerals and also as OH in nominally water free minerals (NAMS). The water has a higher solubility in the kimberlitic melt and thus is removed from the NAMS. The decrease of OH content in NAMS can thus be measured and used to find the composition of the kimberlitic melt. In this study, high-resolution FT-IR based synchrotron measurements of OH concentrations in melt inclusions in lherzolitic garnets from the Kimberly Diamond Mine in South Africa is presented. Many hydrogen profiles in totally embedded microcracks and melt inclusions in these garnet crystals were measured. The measurements show a strong variation in OH-concentrations and demonstrate that the amount of water stored in diamond bearing layers has been underestimated for a long time due to the loss of water during the uplift of the kimberlite.