He, Ne and Ar systematic on the scale of vesicle: implication for noble gases behavior in the mantle.

A. RAQUIN[1], F. Guillon[1] And M. MOREIRA[1]

[1] Esuipe de Geochimie et Cosmochimie, Institut de Physique du Globe de Paris, 4 place Jussieu, F75005 Paris, France: raquin@ipgp.jussieu.fr

The knowledge of the distribution of noble gases in the mantle, both in elemental and isotopic compositions, has important implications for models of volatile acquisition and evolution on Earth. One of the fundamental unknown to estimate fluxes between the different Earth's reservoirs is the origin of the unavoidable air-like component released with traditional experimental procedure in mantle-derived rock. Two possible origins are debated: this component is in the mantle source (recycling via subduction) or is due to a superficial contamination during eruption or in magma chamber or in the lab. Using our new laser UV ablation system on the "popping rock" 2πD43 sample, considered being the most representative sample for the volatile composition of the upper mantle, we are able to have both elemental and isotopic composition for He, Ne and Ar in single vesicles. Helium isotopic ratios and $^{4}He/^{40}Ar^{*}$ ratios are constant whatever the amount of gases released out of the vesicle and the $^{40}Ar/^{36}Ar$ ratio. The mean $^{4}He/^{3}He$ ratio of the different analyzed vesicles is 90,825±1880 whereas the mean $^{4}He/^{40}Ar^{*}$ is 1.06±0.08, similar to the mean ratio determined by Burnard et al. [1]. Argon ratios up to 27,000 ±1500 were observed associated with $^{20}Ne/^{22}Ne$ of 12.8±0.4. Four possible sources for the atmospheric gases in vesicles will be discussed: subducted sediments, subducted gabbros, contamination in magma chamber or contamination in the laboratory using the rare gas elemental and isotopic compositions.

References

[1] Burnard et al. (1997) Science **276**, 568-571