Labex MATISSE

Axe 5 Matériaux en conditions extrêmes

« Primitive degassing of the Earth : the Iodine and Xenon cycles»

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Research project (10 lines)

Atmosphere formation and Earth's differentiation result from magma ocean processes during the Hadean Eon (4.6-4Ga ago). The $^{129}I/^{129}Xe$ extinct isotopic system is used to trace early atmosphere formation, as ^{129}I decayed into ^{129}Xe with a 15.7 Myr half-life. I and Xe present a depletion of their isotopes in the different Earth reservoirs, and belong to two different classes of volatile elements, halogens and noble gases. Indeed, Xe and I behavior are different during the Earth degassing, and unknown during magmatic processes under high pressure and high temperature.
The aim of this thesis is to characterize the different behaviors of Xe and I under HP-HT concerning their incorporation in silicate melts and during a silicate melt degassing with aqueous fluid. We have conducted diamond anvil cells (DAC) experiments with *in situ* X-ray diffraction and fluorescence analyses.

Experiments on silicate melts structure show a Xe incorporation in magma with a Xe-O bound. Degassing experiments at high temperature and high pressure propose a different behavior. Since I is hydrophilic, Xe stay in melt.
We want to use this results to explain the I and Xe isotopic variations in the Earth reservoirs and to constrain models of atmosphere formation

Posters communication : Leroy C., Sanloup C., Bureau H., Schmidt B., Konopkova Z., Raepsaet C., (2014) Incorporation of Xenon in magmas at depth (V53B-4854). AGU Fall Meeting, San Francisco Dec. 14-19 2014.

Three articles are in preparation