Ecole Doctorale des Sciences Fondamentales

Title of the thesis: Equilibrium and Kinetic fractionation of sulphur isotopes in magmas

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Summary :
Sulfur has four stable isotopes, ^{32}S, ^{33}S, ^{34}S, and ^{36}S, of which ^{32}S is the most common with 95% abundance. In general, chemical reactions at high temperature do not discriminate one isotope from another; all S-bearing, equilibrium, phases have the same isotopic composition, in such case. Reactions at low temperature can usually discriminate the isotopes. However, fractionations of these four isotopes are observed among material derived from volcanic eruptions, usually attributed to fractionation during volcanic degassing. While exact mechanism of this fractionation is not well understood, there can be several possible explanations.

The proposed thesis project aims to quantify equilibrium and kinetic fractionation of sulfur isotopes in various geological settings especially related to volcanic eruptions, by laboratory high-temperature, high-pressure, experiments. Because of the lack of laboratory-determined kinetic parameters, the majority of current geochemical interpretations of sulfur isotope data preclude kinetic processes. The project is conceived to fill such obvious gap.

In addition to master-level education in Earth Sciences, following backgrounds would be particularly useful in carrying this research: familiarity with thermodynamic and kinetic theories, ease with programing computations using widely available scripting programs such as MATLAB, Python, R, and other similar software, experience and/or enthusiasm working in experimental petrology lab (meaning heating and pressing rock powders), as well as tenacity to seek highest possible data quality.