

Post Doc on Silica deposits in volcanic and hydrothermal terrains: key to understand water existence and habitability on Earth and Mars

Applications are invited for a 2-year Post Doc fellowship at the Nordic Volcanological Center (NordVulk), University of Iceland, in collaboration with the SIMS facility at the Swedish Natural History Museum in Stockholm, Sweden and University of Copenhagen, Denmark. The position is available from June 1st 2021, and no later than August 1st, 2021.

Title: Post Doc on Silica deposits in volcanic and hydrothermal terrains: key to understand water existence and habitability on Earth and Mars

Research area:
Geochemistry

Project description:

Hydrated silica minerals ($\text{SiO}_2 \cdot n\text{H}_2\text{O}$) are ubiquitous but minor products of aqueous alteration of terrestrial surface. The release of silica into altering water results from the igneous silicate minerals' hydrolysis. Following, silica precipitates abiotically or assisted by life-mediated pathways. Such solids are generally referred to as opaline silica, that encompasses various phases that differ in their structure (amorphous to cryptocrystalline) depending on the formation mechanism and environment. Opaline silica form in various terrestrial environments, and it is commonly found around hydrothermal vents associated with volcanic activities. These silica phases precipitates both abiotically and biogenically, and deciphering formation pathways remains challenging. In addition, opaline silica is a major preservative agent for organic matter including biogenically sourced (Alleon et al. 2016). The ubiquitous presence of water throughout most of Earth's history has led to the transformation of ancient amorphous silica into mature microcrystalline quartz (Williams et al. 1985). Other planetary surfaces, like Mars surface, have undergone similar water alteration, with the most compelling evidence of water on Mars be the widespread hydrated opaline silica deposits detected from spectroscopic remote sensing and in-situ analysis by NASA rover (Squyres, 2008; Carter et al., 2013). Understanding opaline silica formation and maturation and transformation pathways may therefore provide the key to reconstruct planetary water history and live as such formations host and are influenced by organic matter for its long-term preservation (Teece et al., 2020).

The aim of the project is to provide novel data on the kinetics (mechanism and rate) and silicon isotope fractionation on opaline silica formation and maturation. We intend to apply in-situ experimental set-up and use well-characterized natural samples from volcanic and hydrothermal settings to follow the reactions forming biogenic and abiotic silica. Moreover, we intend to use multiple silica isotope characteristics to trace the same processes, but recent studies indicate large isotope fractionations for silica depending on biotic versus abiotic mechanisms (Stamm et al., 2020).

Reference

- Williams, L.A., Crerar D.A., 1985. *J. Sed. Pet.* 55, 312-321. [10.1306/212F86B1-2B24-11D7-8648000102C1865D](https://doi.org/10.1306/212F86B1-2B24-11D7-8648000102C1865D)
- Teece, B. et al. 2020. *Astrobiology*, 20, 537-551. [10.1089/ast.2018.2018](https://doi.org/10.1089/ast.2018.2018)
- Carter, J. et al. 2013. *J. Geophys. Res. Planets* 118, 831–858. [10.1029/2012JE004145](https://doi.org/10.1029/2012JE004145)
- Squyres, S.W. 2008. *Science (80-.)*. 320, 1063–1067. [10.1126/science.1155429](https://doi.org/10.1126/science.1155429)
- Stamm et al. (2020) *Earth Planet. Sci. Lett.* 541, 116287. [10.1016/j.epsl.2020.116287](https://doi.org/10.1016/j.epsl.2020.116287)
- Alleon, J. et al. 2016. *Nat. Commun.* 7. [10.1038/ncomms11977](https://doi.org/10.1038/ncomms11977)

Qualifications and specific competences: PhD degree in geology. Expertise in geochemistry is required. We are looking for a candidate with expertise in aqueous geochemistry and mineralogy

with preference to candidates with previous experimental experience. Mobility of the selected candidate for this position is required.

Place of employment and place of work: The candidate will join the NordVulk team within the Institute of Earth Sciences, University of Iceland for a period of two years. During the project short periods may be required to be spent at the SIMS facility in Stockholm, Sweden as well as at University of Copenhagen, Denmark.

Collaborators:

Andri Stefánsson, Institute of Earth Sciences, University of Iceland, Iceland.

Eniko Bali, Institute of Earth Sciences, University of Iceland, Iceland.

Martin Whitehouse, Nordsim, Swedish Natural History Museum, Sweden.

Dominique Tobler, Nano-Science Center, Department of Chemistry, University of Copenhagen

Application procedures

All information in the application must be in English or a Scandinavian (i.e. Norwegian, Swedish or Danish) language, preferably English. A certified English translation is required for documents written in languages other than English or one of the Scandinavian languages.

The application must contain the following information:

As a minimum all applications must include (pdf-files only, max. 10 MB, no zip):

- Personal information
- Academic background
- Names on two references. The reference letters may be sent directly to rikke@hi.is
- Curriculum vitae of applicant, including list of publications
- Motivation letter (max. 2 pages)
- PhD diploma.
- Transcripts, grade point averages and diploma(s) for both Bachelor's and Master's degree. If the original documents are not in English or one of the Scandinavian languages then copies of the original documents as well as a certified English translation must be attached.

After submission of the application, you will receive a confirmation e-mail.

Please be aware that you must scan/merge all documents into one large PDF file and send as an attachment to rikke@hi.is. If you wish to refer to scientific papers, large reports, theses and the likes, please indicate a URL where the information is available.

NordVulk reserves the right to verify the authenticity of your educational diploma and transcripts:

- Request additional information to verify an application.
- Reject the application if it is proven, or if the Programme Committee has reasonable belief, that the information provided is false or if the applicant refuses to provide the requested information, whether or not an offer has already been made.

Please note:

The Programme Committee may request further information or invite the applicant to attend an interview.

All interested candidates are encouraged to apply, regardless of their personal background.

Applicants seeking further information are invited to contact:

NordVulk leader Rikke Pedersen, phone +354 525 5483 , e-mail: rikke@hi.is.