

Post Doc on Oxygen isotope characteristics of high $^3\text{He}/^4\text{He}$ mantle domains underlying the East African Rift System

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 as well as University of Copenhagen, Denmark. The position is available from June 1st 2021, and no later than August 1st, 2021.

Title:

Oxygen isotope characteristics of high $^3\text{He}/^4\text{He}$ mantle domains underlying the East African Rift System

Research area:

Geochemistry

Project description:

The East African Rift System (EARS) is a site of ongoing continental rifting, that coincides with a mantle plume. Elevated $^3\text{He}/^4\text{He}$ and solar Neon-isotope ratios in lavas and mantle-derived xenoliths reveal the presence of a primordial common mantle plume that likely underlies the entire rift (e.g., Halldórsson et al., 2014). The coincidence of rifting and plume activity at EARS combined with primordial noble gas isotope signatures in EARS lavas bears striking tectonic and geochemical similarity to Iceland. Recently in Iceland, it has been found that the minor element, oxygen isotope ratios ($\delta^{18}\text{O}$), and $^3\text{He}/^4\text{He}$ ratios of primitive Icelandic olivines are able to characterize the source heterogeneity of the olivine host melts, and demonstrate the mixing between depleted mantle, recycled lithosphere, and primordial domains within the Icelandic plume (Rasmussen et al., in review; Rasmussen et al. 2020). If similar relationships exist between primordial noble gas compositions and low $\delta^{18}\text{O}$ values within the EARS mantle source, then this suggests the presence of large-scale processes within the Earth that generate causal relationships between primordial noble gas signatures and oxygen isotopes.

The aim of this project is to document the relationships between the $^3\text{He}/^4\text{He}$, $\delta^{18}\text{O}$, major element, and minor element compositions of highly primitive olivines from the EARS to better identify the enigmatic source of primordial helium isotope compositions on Earth. The project will focus on a large suite of primitive olivines from the EARS that have already been analyzed for $^3\text{He}/^4\text{He}$ and stored at University of Iceland. The olivines will be further characterized in detail in terms of their major element (by EMPA at University of Iceland), trace element (by LA-ICP-MS at University of Copenhagen), and oxygen isotope composition (by SIMS at Nordsim) to refine the mantle source of their parent lava and reveal any effect of crustal contamination.

References:

Halldórsson, S. A., Hilton, D. R., Scarsi, P., Abebe, T. & Hopp, J. (2014) A common mantle plume source beneath the entire East African Rift System revealed by coupled helium-neon systematics. *Geophys. Res. Lett.* 41, 2304–2311.

Rasmussen, M. B., Halldórsson, S. A., Jackson, M. G., Bindeman, I. N., Whitehouse, M. J. (in review) Formation of the Iceland Plateau by enriched plume flux and entrainment of deeply stored domains. *PNAS*

Rasmussen, M. B., Halldórsson, S. A., Gibson, S. A. & Guðfinnsson, G. H. (2020) Olivine chemistry reveals compositional source heterogeneities within a tilted mantle plume beneath Iceland. *Earth Planet. Sci. Lett.* 531, 116008.

Qualifications and specific competences:

PhD degree in geology. Expertise in geochemistry is required. We are looking for a candidate with expertise in mantle geochemistry with preference to candidates with previous SIMS and laser ICP-MS 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:

Sæmundur Ari Halldórsson, NordVulk, Institute of Earth Sciences, University of Iceland, Iceland.

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

Nina Søager, University of Copenhagen, Denmark.

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.