Exploring phosphates and carbonates as an archive of the zinc-isotope chemistry of past oceans

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Project Description:

Zinc is one of a series of transition metals whose isotopic expression in geological minerals is being explored as a tracer of past ocean chemistry. The removal of zinc to marine sediments ‘fractionates’ the Zn in seawater, preferentially removing the lighter isotopes. Over time, this process can be hypothesized to control secular changes in the Zn-isotope composition of seawater, a process that might be exploited to reconstructing long-term changes in the redox state of the oceans. The major problem with exploiting this proxy is finding a suitable geochemical archive of Zn-isotopes in palaeo-seawater. Two possibilities are using the aragonite and calcite that are formed by shallow-water dwelling marine organisms; and/or the phosphatic carbonates that form diagenetically in marine sediments. This project will investigate both of these archives, and will seek to answer the following basic questions:

1. Do biogenic calcite and aragonite, and carbonate fluorapatite, retain Zn-isotope compositions similar to the modern seawater and sediment porewaters in which they form?
2. What are the processes that control differences between the Zn-isotopic composition of modern carbonates and seawater?
3. How do diagenetic processes affect the Zn-isotope composition of carbonates as they are buried in the geological record?
4. Can carbonates be used to directly infer secular changes in past ocean chemistry?

The project will involve fieldwork to collect modern marine carbonates and seawater from Bermuda, and to collect archived core samples from the International Ocean Discovery Programme in Texas and/or Germany. Further samples will be obtained by project collaborators. The student will be trained in field sampling, techniques for the extraction and purification of zinc from geological samples, and isotope mass-spectrometry.

Details on how to apply can be found here [www.rhul.ac.uk/studyhere/postgraduate/applying](http://www.rhul.ac.uk/studyhere/postgraduate/applying)

Please contact the Postgraduate Programmes Co-ordinator, if you have additional questions about the department or application procedures (email: pgadmin@es.rhul.ac.uk ; tel: 01784-443581).

Applicants are requested to send an additional copy of their CV directly to the lead supervisor of the project in which they are interested. Please also contact the supervisor if you have any questions about the project itself.