

Basalt-Seawater-Microbe Interactions During Oxidative Alteration of the Upper Ocean Crust

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Marine Chemistry & Geochemistry

What were the primary questions you were trying to address with this research? (Or, if more appropriate, was there a hypothesis or theory that you were trying to prove or disprove?)

We hypothesized that microbial Fe oxidation is an important process in ocean crust alteration and has a large control on chemical exchange between circulating seawater and upper crust.

What have you discovered or learned that you didn't know before you started this work?

The idea that weathering of ocean floor basalt may support microbial biomass production was purely hypothetical. Although we have yet to determine the exact relations between rock alteration and microbial colonization, different lines of evidence clearly suggest that microorganisms are specifically adapted to exploiting energy stored in ocean floor basalt and other inorganic seafloor materials.

What is the significance of your findings for others working in this field of inquiry and for the broader scientific community?

The ability to oxidize ferrous iron is a very common trait in deep sea microorganisms. Bacteria that colonize ocean floor basalt are remarkably diverse.

What is the significance of this research for society?

Primary production of biomass fuelled by the weathering of ocean floor materials may be significant for deep-sea carbon cycling

What were the most unusual or unexpected results and opportunities in this investigation?

What were the greatest challenges and difficulties?

When and where was this investigation conducted? (For instance, did you conduct new field research, or was this a new analysis of existing data?)

What were the key tools or instruments you used to conduct this research?

The submersible Alvin was used for deploying and recovering in situ incubation experiments and retrieving environmental samples from the seafloor

Is this research part of a larger project or program?

Yes, we have used the DOEI funds to spin up a larger, NDF-funded project with the same general idea.

What are your next steps?

Figuring out the details. E.g., what exactly are the microorganisms doing with the basalt, what controls initial colonization and how do communities change as rock alteration proceeds.

Have you published findings or web pages related to this research? Please provide a citation, reprint, and web link (when available).

Edwards, K.J., Bach, W. und Rogers, D.R. (2003) Geomicrobiology of the ocean crust: A role for chemoautotrophic Fe-bacteria. *Biological Bulletin*, 60, 180-185.

Bach, W. und Edwards, K.J. (2003) Iron and sulfide oxidation within the basaltic ocean crust: implications for chemolithoautotrophic microbial biomass production. *Geochimica et Cosmochimica Acta*, 67, 3871-3887.

Edwards, K.J., Bach, W., McCollom, T.M. und Rogers, D.R. (2004) Neutrophilic iron-oxidizing bacteria in the ocean: habitats, diversity, and their role in mineral deposition, rock alteration, and biomass production in the deep-sea. *Geomicrobiology Journal* 21(6), 393-404

Edwards, K.J., Bach, W., and McCollom, T.M. Geomicrobiology in Oceanography: Mineral-Microbe Interactions in the Deep-Sea, *Trends in Microbiology*, in press

Please suggest or provide photographs, illustrations, tables/charts, and web links that can help illustrate your research.

K – cruise webpage, your webpage ...

Please provide some biographical information, such as place of birth, degrees earned, significant awards or honors, research interests, reasons why you became a scientist or why you are interested in this line of research, and any personal interests, hobbies, or details that you are willing to share. You can find a few good examples here:

<http://oceanusmag.who.edu/v42n2/wirschen-bio.html>

<http://oceanusmag.who.edu/v42n2/sohn-bio.html>