Contrasting patterns of bacterial weathering of granite, granulite and gabbro from tropical regions of south India

R. SUBASHRI[1], J. K. DASH[2], S. BALAKRISHNAN[2]*, AND N. SAKTHIVEL[1]

[1]Department of Biotechnology, Pondicherry University,
[2] Department of Earth Sciences, Pondicherry University, Puducherry – 605014, India
(*correspondence: balakrishnan.srinivasan@gmail.com)

Bacterial weathering of various rock forming minerals have been studied in detail. Such studies on bulk rocks are essential to better understand bacterial weathering. Results of four different bacterial activity on three different rock types are presented.

Biotite granite, garnetiferrous felsic granulite and gabbro from tropical region of south India were collected and powdered to < 120 μm. The bacterial strains, RB 9, 15, 21 and 24, isolated from the rhizoplane of *Ficus* which grew on rocks were identified as *B. multivorans, C. malonaticus, E. aerogens* and *P. pleccoglossicida* respectively. They were grown for 28 days in a medium containing glucose and rock powder as the carbon and nutrient sources, respectively. Rock and abiotic controls were included. The residual pellets devoid of bacteria and other contaminants were analysed using XRD and ICP-MS.

Bacterial action on the biotite granite weathered biotites completely while microcline and albite were altered to varying degrees by different bacteria. All the major elements were depleted (30-50 %), while 25-40 % reduction of trace elements and REE were observed. P_2O_5 and Ni reduction varied with individual strains.

Felsic granulite showed removal of almandine garnet and reduction in albite and orthoclase to a larger extent. RB15 exerted moderate reduction (10-30 %) and did not fractionate major elements. Whereas, other bacteria showed considerable depletion of MgO (> 60 %). RB24 and RB25 were found to mobilise HREE (~ 30 %) while RB15 released relatively more Eu and trace element release was bacterial dependent.

The gabbro consisting of orthopyroxene, clinopyroxene and plagioclase did not show detectable change in the mineralogy. All the strains enriched Mn while RB9 depleted it. RB25 was found to enrich more HREE compared to LREE and Eu was depleted by RB9. Each bacteria followed unique patttern in release of trace elements.

Microbial weathering of granite, felsic granulite and gabbro show distinct patterns of minerological and chemical changes. Each bacterial strain had unique signature in altering the major and trace element abundances of a given rock.

LabData-GC: a database sub-system for post-processing and quality control of CFC and SF_6 measurements

AXEL SUCKOW[1]*

[1]CSIRO Land and Water, Urrbrae, SA 5064, Australia
(*correspondence: Axel.Suckow@csiro.au)
[2] National Centre for Groundwater Research and Training (NCGRT), Flinders University, Adelaide

Low-level gas-chromatography measurements, as they are needed for groundwater dating using CFCs and SF_6 often use commercial software for signal detection, peak detection and integration. The raw data and the parameters used during integration as well as the standards and blanks used to determine the absolute concentrations of unknown samples need to be stored for traceability of results.
A database sub-system to the LabData LIMS [1] is presented that covers:

1. storage of all raw data (signal versus time)
2. storage of parameters of peak integration
3. storage of all attribute data of the measurement (sample-ID, origin, project context etc.)

The corresponding graphical user interface and post-processing algorithms allow the calculation of absolute concentrations in water from

1. blank time series
2. sensitivity time series from standard measurements
3. linearity measurements (dependence of sensitivity from peak area)
4. graphical display of all relevant result by export to MS Excel

The database sub system is integrated in a multi-user client server architecture using MS SQL server as back-end and a graphical user interface based on MS Access. The existing modelling capabilities of age distributions using a lumped parameter approach are an add-on. The source code is public domain software and available under the GNU-GPL licence agreement.

[1] Suckow, Dumke (2001): *A database system for geochemical, isotope hydrological and geochronological laboratories*. Radiocarbon 43, No. 2, pp. 325-337.

10.1180/minmag.2013.077.5.19