Geochemical Transactions

BioMed Central

Methodology

Open Access

Advantages of doubly polished thin sections for the study of microfossils in volcanic rock

M Ivarsson*

Address: Dept. of Geology and Geochemistry, Stockholm University, Stockholm, Sweden

Email: M Ivarsson* - magnus.ivarsson@geo.su.se

* Corresponding author

Published: 30 May 2006

Geochemical Transactions 2006, **7**:5 doi:10.1186/1467-4866-7-5

Received: 17 January 2006

Accepted: 30 May 2006

This article is available from: http://www.geochemicaltransactions.com/content/7/1/5

Abstract

Doubly polished thin sections, originally prepared for fluid inclusion studies, present great advantages in the study of microfossils in volcanic rocks. Better visibility and light conditions, variation in thickness of the thin sections and the possibility to combine fluid inclusion studies with microfossil studies lead to a wide range of advantages over ordinary thin sections. This includes the study of morphology, internal microstructures, colonies, association with the substrate that microfossils are attached to and geological and environmental context in which the microfossil once lived. When meeting the criteria of microfossil recognition the advantages of doubly polished thin sections are substantial and can be crucial in distinguishing between biogenic microfossils and abiotically formed abiomorphs.

Introduction

Knowledge of the deep subsurface biosphere is constantly increasing, which creates a need for new analytical methods. Only during the last decade has it been evident that lithoautotrophs exist deep in the ocean crust in association with hydrothermal systems [1,2]. Such bacteria are found attached to volcanic glass or mineral surfaces using elements like Fe or Mn for their metabolism.

When studying fossilized microorganisms in hard rock, optical microscopy of thin sections is an essential tool because it is the only technique to study the isolated interior of rock samples without contamination and it also facilitates morphological and microstructural studies [3]. In this paper the use of doubly polished thin sections (sections that are polished on both sides) for studies of microfossils is emphasized. Doubly polished thin sections have somewhat different properties that make them more suitable for the study of microfossils compared to ordinary thin sections. First of all, it is possible to vary the thicknesses of the thin sections to fit the size of the observed feature. Usually they are between 150 and 200 μm compared to ordinary thin sections that normally are ~30 μm. Furthermore, they can be viewed under the microscope without being mounted on a microscopic glass slide. Thus, they offer better light conditions, higher visibility and an increased three-dimensional view.

In this study rock samples collected during the Ocean Drilling Program (ODP) Leg 197 at the Emperor Seamounts in the Pacific Ocean have been used. During that Leg three different seamounts were drilled, Detroit, Nintoku and Koko Seamount, respectively, and four sites were drilled: Site 1203 (50° 57.00'N, 167° 44.40'E) and Site 1204 (51° 11.68'N, 167° 46.36'E) at Detroit Seamount, Site 1205 (41° 20.00'N, 170° 22.70'E) at Nintoku Seamount and Site 1206 (34° 55.55'N, 172° 8,75'E) at Koko Seamount. Basalt samples from all four sites were