Nitrifying potential in *Beggiatoa* mats from marine mangroves

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Marine mangroves are intertidal marine ecosystems found in tropical and sub-tropical areas. A development of white bacterial mat can be found in Guadeloupian marine mangroves. This mat consists of a layer of micro-organisms deposited above the anoxic sediment consisting of eukaryotes (e.g. diatoms, nematodes) and prokaryotes (e.g. filamentous cyanobacteria, filamentous sulfur-oxidizing bacteria, archae). Most of the filamentous bacteria found in the mat belong to the genus *Beggiatoa*. These bacteria contain genes encoding both for sulfur oxidation (production of sulfate) and ammonium oxidation (production of nitrate).

The aim of this study was to determine the potential for nitrification is these *Beggiatoa* mats. Potential nitrification rates were carried out with the *Beggiatoa* mat collected in a marine mangrove. The *Beggiatoa* mat or filaments were amended with sea water containing different NH_4^+ concentrations and incubated under oxic conditions. The increase in nitrate concentration was measured after 15 hours of incubations. Potential nitrification rates showed a large variation ranging from 0.2 to 2200 μg nitrate N L^{-1} h^{-1}. Our study showed the potential for nitrification in *Beggiatoa* filaments, implying an important link between the N and S cycles, by sulfur oxidizing bacteria, in these mangrove systems.

Examination of Magma Degassing Paths Based on Melt Inclusions

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In a landmark paper, Newman *et al*. [1] suggested that the CO_2 and H_2O contents of volcanic glasses could be used to understand magma degassing processes. This approach was immediately adopted by Anderson *et al*. [2] and applied to melt inclusions (MI) in quartz phenocrysts from the Bishop Tuff to investigate the pre-eruptive volatile contents and pressures in the magma chamber during phenocryst growth and MI entrapment. In the nearly three decades since these pioneering studies, numerous MI studies have been conducted to determine magma degassing paths using this method.

The scientific basis for using CO_2/H_2O systematics in MI is robust and supported by experimental data, but several unstated assumptions are required for the results to accurately define a magma degassing path. First, the trapped melt must have been at volatile saturation. Additionally, the melt (glass) that is analyzed must represent the melt that was originally trapped and must be free of any post-entrapment modifications (or it must be possible to reverse these processes before analysis or account for these changes by other means). Thus, post-entrapment crystallization on the walls of the MI, diffusional loss of H_2O from the MI and exsolution of a vapor bubble after MI entrapment are all processes that will affect the CO_2/H_2O systematics of the MI.

Examination of data from a variety of sources suggests that in many cases there is clear evidence for post-entrapment modifications (primarily shrinkage bubble formation) that have not been corrected for during analysis or data interpretation. Moreover, recent studies have shown that these modifications can produce "false degassing paths" that cannot be distinguished from true degassing paths. It is also critical that MI be studied within a paragenetic context in order to constrain relative times of MI formation, and that other indicators of crystallization progress and/or depth of formation be monitored along with the CO_2/H_2O systematics to confirm that the volatile data record a degassing history.

[1] Newman *et al*. (1988) *J. Volcanol. Geotherm. Res*. **35**, 75-96. [2] Anderson *et al*. (1989) *Geology* **17**, 221-225.

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