

Biological oxidation of Fe(II) in biotite and hornblende from quartz diorite.

Abstract

Weathering of bedrock is generally thought to be a physical or chemical process. However, it has been shown that microbes are capable of weathering rock near the surface and in saturated, oxygen-depleted zones. The role of microbial weathering of minerals in the unsaturated subsurface has not been adequately explored, because microbial mass has been thought to be too low to be of significance. Lithoautotrophic bacteria are better suited to survive in the unsaturated subsurface near weathering bedrock known as “saprock”, because of their ability to use non-carbon elements as electron donors for energy generation and fix CO₂ to make cell mass. We hypothesize that Fe(II)-oxidizing, lithoautotrophic bacteria are surviving and metabolizing in “saprock” in the Luquillo Experimental Forest, Puerto Rico by utilizing Fe(II) from bedrock minerals biotite and hornblende as their energy source. We propose to study *Stenotrophomonas maltophilia*, cultured from the saprock, to determine whether it has the ability to oxidize structural Fe(II) in indigenous biotite and hornblende as its sole energy source. This objective will be tested using microscopy and synchrotron X-ray microprobe fluorescence. Understanding of bacterial Fe(II) oxidation in saprock will help us evaluate the potential for primary productivity in unsaturated subsurface environments around the world.