The hydromagnesite playas of Atlin, British Columbia, Canada: A biogeochemical model for CO_2 sequestration

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Reaction of silicates with CO_2 to form carbonate minerals has been occurring over geological time and currently sequesters approximately 100 MtC/year [1]. Silicate weathering in bedrock is biogeochemically coupled to the precipitation of carbonate minerals by microorganisms [2] as seen by the combined process of bedrock weathering and carbonate precipitation by oxygenic phototrophic bacteria in Equation 1 [2, 3].

$$\mathbf{(Ca,Mg)SiO_3 + 2H_2CO_3 + H_2O \rightarrow} \quad \mathbf{(1)}$$

$$\mathbf{(Ca,Mg)CO_3 + H_2O + H_4SiO_4 + O_2}$$

Regions with mafic and ultramafic bedrock, such as Atlin, represent the best potential feedstocks for mineral carbonation [4]. Polished serpentinite cubes placed in the critical zone in coniferous forest for three years provides direct evidence for the microbial involvement in Mg silicate weathering (Fig. 1). Detailed site characterization of the Atlin hydromagnesite playas includes geochemical, microbial, and isotopic data demonstrating the link between bioweathering and microbial mediated $MgCO_3$ precipitation in the context of a CO_2 sequestration model.

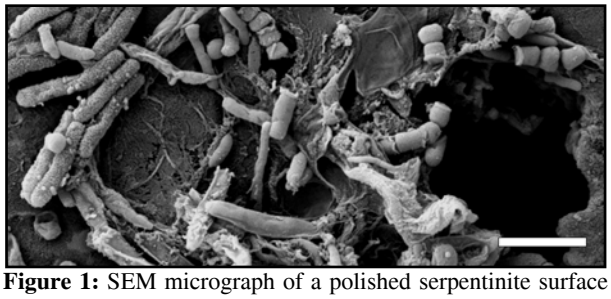

Figure 1: SEM micrograph of a polished serpentinite surface showing bacteria colonized near a corrosion pit (bar = 2 μm)

[1] Siefritz (1990) *Nature* **345**, 486. [2] Ferris *et al.* (1994) *Geomicrobiol. J.* **12**, 1-13. [3] Power *et al.* (2007) *Geochem. Trans.* **8**,13. [4] Lackner *et al.* (1995) *Energy* **20,** 1153-1170.

Ultramafic hosted vermiculite occurrence from ancient supracrustal belt, Dharwar craton, south India

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Vermiculite mineralization in its macroscopic form occurs in association with Archaean supracrustal rocks of Sargur belt around Handanahalli area (Lat. 76°28'903"; 12°17'611") in Dharwar craton. They are found associated with ultramafic and acidic intrusive rocks belonging to ancient Sargur supracrustal belt. Petrographic and mineralogic studies show that the primary mineral phases in the host ultramafic rock such as pyroxenes show alteration to hornblende and biotite, which inturn show alteration to vermiculite. Acidic intrusion occurs in the form of quartz and quartzo-feldspathic veins. Chemical analyses of the vermiculite show the higher concentration of MgO and FeO and very low values of K_2O. X-ray diffraction patterns show the presence of characteristic basal diffractions of vermiculite. FTIR studies indicate the presence of OH groups coordinated with other cations. DTA curves indicate rhythmic dehydration of the vermiculite. Alteration of the ultramafic rock is attributed due to the role of mixed aqueous -carbonic inclusions present in acidic intrusive rocks. The probable origin of the vermiculite from biotite through hydrobiotite is discussed.

Handanahalli (76°28'903"; 12°17'611")

The ultramafic rock is composed of both ortho-and clino-pyroxenes and secondary hornblende. Based on the mineralogy, the ultramafic rock can be designated as metapyroxenite.

Macroscopic Vermiculite Associated with the Ancient Supracrustal Rocks Designated

Vermiculite mineralization in the Gopalpura area, Karnataka in the Archean supracrustal rocks of the Sargur Group as studied. The vermiculite deposits occur as discontinuous lenses and pockets within the ultramafic rock and at the acid intrusion contacts. Detailed mineralogy as studied using microscopy, X-ray diffraction, infrared spectroscopy, differential thermal analyses, and electron microprobe analyses. The probable origin of the vermiculite from biotite through hydrobiotite is also discussed.