Dunite as a source of H2 and Ni for the hydrogenotrophic methanogen Methanoculleus bourgensis MAB1: Insights into methanogenic life at ultramafic hydrothermal settings

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Abstract

Methanogens are believed to be one of the first life forms that evolved on early Earth, using chemical energy and nutrient sources such as H2, CO2, and reduced trace metal ions produced by fluid-rock interactions. One suggested process for H2 formation is serpentinization of ultramafic rocks in hydrothermal vent systems and methanogens have been found in such systems. In the fossil record, however, very few fossils have been found within ultramafic rocks, indicating that low-silica and high-magnesium rocks may not be an optimal growth medium for chemolithotrophic microorganisms. In order to test the suitability of serpentinization alone to provide energy and nutrients to strictly hydrogenotrophic methanogens, we performed long-term incubation experiments using *Methanoculleus bourgensis* strain MAB1, together with dunite powder without any extra added substrate and with/without addition of nickel. The incubation experiment was maintained for over 1000 days and showed that H2, and not nickel, is likely the limiting factor for growth of methanogens.

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