Microbe-mineral interactions between *Thermovibrio ammonificans*, a deep-sea vent microbe, and asbestos minerals

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Asbestos, a group of naturally-occurring silicate minerals, is well-known for causing mesothelioma and other terminal human diseases. As such, technologies that can reduce asbestos toxicity before human exposure are desirable. Here, we explore microbes capable of colonizing and/or weathering silicate-rich substrates at Mid-Ocean Ridges as potential agents for asbestos bioremediation. Using *Thermovibrio ammonificans*, a chemolithoautotrophic bacterium capable of Si incorporation into biofilms, we are investigating *in vitro* microbe-mineral interactions in the presence of chrysotile and tremolite-actinolite. Our goal is to evaluate the capability for and mechanism of Si removal from asbestos minerals as a way to reduce their hazards. Initial results show that the presence of *T. ammonificans*, which grew unaffected in the presence of asbestos, increased amorphous grain boundaries of both asbestos types after 48 h at 75°C. With chrysotile, aqueous [Mg^{2+}] and [Si] increased in the external medium (both in the absence and the presence of bacterial cells) in a 1.45 [Mg^{2+}] to 1 [Si] ratio, which agrees with transmission electron microscopy (TEM) analyses showing loss of Mg in chrysotile fibers. However, X-ray maps and secondary electron microscopy (SEM) analyses revealed a decrease in Mg/Si ratios within biofilms due to progressive Si accumulation. *In vitro* assays with tremolite-actinolite displayed minimal increases in aqueous [Mg^{2+}] and [Si] after 48 h, and X-ray maps from SEM showed no fluctuations in Mg/Si ratios within biofilms, suggesting minimal interactions between *T. ammonificans* and tremolite-actinolite. Altogether, these results highlight the need for tailored bioremediation technologies accounting for crystallochemical differences among serpentine and amphibole asbestos minerals.