Characterizing interactions between electrical potential, microbial activity and mineralogy at hydrothermal vents

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High temperature hydrothermal vents are complex systems, with steep thermal, chemical, and redox gradients over centimeter- scale spatial scales, additionally complicated by temporal variation. One of the most interesting features at these vents is the formation of hydrothermal chimneys via mineral deposition at the point of mixing [1]. These chimneys have been observed to exhibit metal-like conductivity [2] and host a diverse array of microbes. The mineralogy of chimney formation as well as the microbial metabolisms present in chimneys have been and continue to be explored [3]; however one understudied component is the role of electrochemistry in these systems. Here we have used a bioelectrical system in order to explore the ways in which electrical current, microbial communities and conductive and non-conductive minerals interact, specifically isolating differences between living and dead microbial communities and electrical potential on the system chemistry. We demonstrate that both the electrical potential applied to a system and the presence of a live microbial community have a profound influence on the mineral partitioning within the lab based system, and discuss parallels and applicability to a natural hydrothermal vent environment.

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