



## **Biological Communities in Desert Varnish and Potential Implications for Varnish Formation Mechanisms**

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Desert varnishes are thin, orange to black coatings found on rocks in arid and semi-arid environments on Earth. The formation mechanisms of rock varnish are still under debate and the involvement of microorganisms in this process remains unclear. In this work we aimed to identify the microbial community occurring in rock varnish to potentially gain insights into the varnish formation mechanism. For this purpose, rocks coated with desert varnish were collected from the Anza-Borrego Desert, California, USA, as well as soils from underneath the rocks. DNA from both varnish coatings and soil samples was extracted and subsequently used for metagenomic analysis, as well as for q-PCR analyses for specific species quantification. The element composition of the varnish coatings was analyzed and compared to the soil samples. Rock varnish shows similar depleted elements, compared to soil, but Mn and Pb are 50-60 times enriched compared to the soil samples, and about 100 times enriched compared to the upper continental crust. Our genomic analyses suggest unique populations and different protein functional groups occurring in the varnish compared to soil samples. We discuss these differences and try to shed light on the mechanism of Mn oxyhydroxide production in desert varnish formation.