DESERT VARNISH – PRESERVATION OF BIOFABRICS / IMPLICATIONS FOR MARS

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Desert varnish is the orange to dark brown rind that accumulates on exposed rock surfaces in many arid environments. Samples from the Sonoran Desert of Arizona are composed predominantly of clays (illite, smectite) and Mn- and Fe- oxides (birnessite, hematite). Features that appear to be single organisms are found within the varnish and at the rock-varnish interface. Many of these features are embedded in films that strongly resemble the water-rich extracellular polysaccharides produced by diverse microorganisms. Most common are rod-shaped cell-like objects, 0.5-2 microns in the longest dimension, located within the varnish coatings. Some of these objects are shown to contain amines by fluorescence microscopy.

The rod-shaped objects are observed in various states of degradation, as indicated by C and S abundances. Rods with higher C and S abundances appear less degraded than those with lower concentrations of these two elements. Regions rich in apparent microbes are present, while other regions display Mn- and Fe-rich mineral fabrics with microbe-sized voids and no obvious cells. These textures are interpreted as biofabrics, preserved by the precipitation of Mn and Fe minerals.

We are researching the preservation of biofabrics by desert varnish in Earth's geological record. Rock coatings may similarly preserve evidence of microbial life on the hyper-arid surface of Mars.