American Mineralogist, Volume 91, pages 1715–1729, 2006

Presidential Address to the Mineralogical Society of America, Salt Lake City, October 18, 2005

Mineral surfaces and the prebiotic selection and organization of biomolecules

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Abstract

One of the most enigmatic steps in Earth's ancient transition from a lifeless planet to a living world was the process or processes by which prebiotic organic molecules were selected, concentrated, and organized into the essential macromolecules of life. More than a half-century of theory and experiment points to the critical roles of mineral surfaces in the assembly of proteins, lipid bilayers, and genetic polymers. This review considers three aspects of this problem: (1) the self-assembly of lipids, which may be enhanced in the presence of minerals; (2) the role of minerals in polymerization of amino acids and nucleic acids; and (3) the selective adsorption of organic species, including chiral molecules, onto mineral surfaces.

Keywords: Surface studies, calcite, quartz, feldspar, new technique, microarray, origin of life