Polymerization of Amino Acids on Mineral Surface by Wetting/Drying Cycles

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Numerous researches on the origin of life have focused on the role of minerals in the polymerization of amino acids. There are various factors that can affect the polymerization of amino acids especially in harsh environments similar to a deep sea hydrothermal vent. On the contrary, At temperature below 100 C without amino acid activation and in the absence of any condensation agents, amino acid oligomerization proceeds to a certain extent when applying drying/wetting cycles on clays, silica and alumina (Lahav et al., 1978; Lawless and Levi, 1979; Bujdak et al., 1994, 1995, 1996; Bujdak and Rode, 1996, 1997). This study is focused on the processes resulting to amino acid polymerization during wetting and drying cycles on minerals.

Experimental methods are largely based on the study by Bujdak and Rode (1997). A 0.02g mixture of catalyst consisting -alumina and Na-montmorillonite with varying proportions (e.g. 0:100, 25:75, 50:50, 75:25, 100:0) was mixed with 2ml of 10mM L-Alanine amino acid solution in glass vials. The suspensions were dried and heated in an oven at 80 C for 24h (the 1st step of a cycle). The proceeding step involves the addition of 1 ml distilled water (the 2nd step). The steps are repeated several times to simulate the drying and wetting cycle.

Results suggest that the polymerization of amino acids proceeds more favorably with Na-montmorillonite than -alumina. Furthermore, the geochemical characteristics of the minerals are greatly influencing the amino acid polymerization process.