

Salinity effect on Adsorption of Nucleic Acids Compounds onto Montmorillonite: A Prebiotic Chemistry Experiment

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Introduction: Nowadays, any proposal on Earth's primitive environments requires a combination of different geochemical variables [1]. However, most absorption experiments are performed in distilled water and seawater analogues which may be inconsistent with a representative primitive ocean model. Therefore, experiments that consider the composition and concentration of dissolved salts in the early ocean need to be performed in order to understand which variables could have affected the absorption of organic molecules into minerals [2]. In this work, the absorption of adenine, adenosine and 5'AMP onto Na⁺ Montmorillonite was studied using a "primitive ocean analog (4.0 Ga)" [3]. Two important results were found in the interaction between organic compound-salts-mineral. First, the dissolved salts affected the absorption in all cases, and the size and structure of each organic molecule influenced the amount of absorption. Specifically, the X-ray analysis showed that interlayer channel broadening is lower in the presence of salts, which would suggest that the salts are reducing the absorption process. Second, using models of isotherms, we found that absorption capacity is clearly affected by dissolved salts in thermodynamic terms. Indeed, our models of molecular dynamic show that it is possible that salts are involved in the formation of complexes between organic molecules and the inorganic surface that limits the interaction. In general, this research showed that the absorption process could be affected when using solutions with high concentration of salts because the metals and organic molecules may be in competition for available sites on inorganic surfaces.

References:

[1] Hazen, R. and Sverjensky, D. (2010) *Cold Spring Harbor Perspectives in Biology* 2:a002162

[2] Izawa, M., Nesbitt, H., MacRae, N. and Hoffman, E. (2010) *Earth and Planetary Science Letters* 298:443-449

[3] Zaia, D. (2012) *International Journal of Astrobiology* 1:229-234