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Effects of Gamma Irradiation in Nucleic Acids Bases Co-adsorbed in a Na-montmorillonite and Fe-montmorillonite: Relevance in Chemical Evolution

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Several authors have been proposed that mineral surfaces had an important role in the study of origin of life, especially in the stage of chemical evolution, due to their ancient origin, wide distribution, adsorption capacity and their physico-chemical properties. Clay minerals can be considered as sites for concentration and catalysis of different reactions, and as protectors of the organic molecules adsorbed into them exposed to an external energy source[1]. The knowledge of the role of clays in the primordial Earth can be extended, studying the behavior of organic compounds, like nucleic acid bases, adsorbed in these minerals, and expose to the action of an energy source[2, 3].

Our aim is to study the role of clays in chemical evolution as a site of concentration of adenine and thymine, to study the effect of co-adsorption in these complementary bases, and as protector agent under γ radiation of adenine-clay system, thymine-clay system, and adenine+thymine-clay system, in simulated primitive Earth conditions. For these purposed bases adsorbed on Fe-montmorillonite and Na-montmorillonite were exposed at different irradiation dose, temperatures, and pH. The bases and radiolytic products were analyzed by UV spectrophotometry, IR spectrometry and High-Performance Liquid Chromatography-Electrospray Ionization-Mass Spectrometry (HPLC-ESI-MS). Our results show that adenine is adsorbed near 98% at pH acid, but the adsorption of thymine is very low (near 30%). However, when these bases are adsorbed from the same solution, a co-adsorption phenomenon takes places, and there was a significant increment in the adsorption of thymine into the clay. Also, the protection role of the clays toward ionizing radiation was observed, and there was a high recovery of the bases under study.

Our aim is to study the role of clays in chemical evolution as protector agent under γ radiation. We study the co-adsorption of adenine and thymine-clay systems at different irradiation doses, pH to evaluate the adsorption and degree of decomposition

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