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ADSORPTION OF NUCLEIC ACID BASES AND RIBOSE BY MG RICH MONTMORILLONITE

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Clay minerals might have some effects on chemical evolution, because clay minerals adsorb organic molecules and catalyze organic molecules. It is accepted that RNA is one of the most important biopolymers at the early earth. RNA is composed of nucleic acid bases, a ribose and a phosphate group. Montmorillonte in clay minerals can easily adsorb cationic organic molecules, metal cations or water and intercalate them into an interlayer. Existence of several different intercalated sites was identified in montmorillonte (Van der Gaast; Abstract in Euroclay 1999) and such difference might give a special arrangement or adsorption to organic molecules. In order to gain insight into relationship between montmorillonite and nucleic acid bases or ribose, adsorption of adenine, cytosine, uracil and ribose is carried out.

Montmorillonite was obtained by a collection of the particle under 2 micrometers from Wyoming bentonite. Mg rich montmorillonite (Mg-Mt) was obtained by exchange of a cation in the interlayer for Mg^{2+}. Nucleic acid bases and ribose solution were prepared between 0.4 and 4mmol/l. 200 or 300mg of Mg-Mt and 7ml of the solution were put into the bottle and shaken for 43 hours. After that, the sample was centrifuged to separate the supernatant and the Mg-Mt. The supernatant and the starting solution were analyzed by a total organic carbon analyzer. Adsorption was estimated by their carbon contents.

Adsorption isotherms of nucleic acid bases and ribose increased linearly against an equilibrium concentration. They did not reach saturation for adsorption. As compared with adsorption of three nucleic acid bases at the same equilibrium concentration, adenine was adsorbed best of the three nucleic acid bases and adsorption of uracil was lowest of all. On the other hand, ribose was hardly adsorbed on Mg-Mt.