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Interaction of Nucleic Acid Bases with Metal Ferrocyanides and its Implications in Chemical Evolution on Planet Earth

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It has been proposed that metal cyanide complexes would have acted as effective prebiotic catalysts [1, 2]. Insoluble metal cyanide complexes could have concentrated biomolecules from the dilute prebiotic soup [3, 4], facilitating certain prebiotic reactions. In the light of the above hypothesis, interaction of two nucleic acid bases, namely thymine and uracil, with lead, copper, cobalt and silver hexacyanoferrate complexes was studied over a range of pH 1.0 to 10.0 under room temperature (30 ± 1° C). The progress of adsorption was followed spectrophotometrically by measuring the adsorbance of the nucleic acid base solutions at their corresponding λ_{max} .Maximum adsorption was found to occur at neutral pH for both thymine and uracil.The adsorption process was then carried out over a range of concentration of the bases (10^{-4} M to 10^{-5} M) and thymine was found to have been adsorbed in greater quantities than uracil. The Langmuir type of adsorption was followed with the performance of the metal ferrocyanides in the general order of CuFc > AgFc > CoFc > PbFc for the adsorption of thymine and CuFc > CoFc > AgFc > PbFc for the adsorption of uracil. In the presence of salt, the adsorption of both thymine and uracil was found to have been elevated.

Conclusions

Results on the present studies suggest the importance of metal ferrocyanides as possible condensing agents for biomolecules during the course of chemical evolution and the origin of life on prebiotic earth. The insoluble metal ferrocyanides on coming in contact with biomolecules must have either formed metal complexes or could have enhanced the formation of biopolymers in fluctuating environment.

References

1. Brij B. Tewari and Kamaluddin , Ninth National Space Science Symposium (NSSS-96) , Osmania University , Hyderabad ,India ,1996, Proceedings page 93.
2. Brij B. Tewari and Kamaluddin, Eighty Third Session of Indian Science Congress, Patiala, India, 1996, Proceedings page 34.
3. B. B. Tewari and R. W. Webster, Bolivian J. Chem. 23(1) , 77-81, 2006.
4. B. B. Tewari and N. Hamid, Colloids and Surfaces, 296, 264-269, 2007.