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Study of the Effect of Varying the Concentration of Zinc Sulphate in the PEM on The pH and Blue Colour Intensity of the PEM of 1.531211 BMJ24 Jeewanu (Both PUOC and PUAC)

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ABSTRACT: Simple self-assembly supra-molecular structures which can exhibit behaviors that mimic real cells could have played a key role in the emergence of life on Earth.

According to Bahadur and Ranganayaki the earliest living cells was very simple in structure and were full of the properties of biological order.

Bahadur in 1967 suggested that the way in which the systems organize themselves with properties of biological order is very important feature of the study of origin of life. Jeewanu, the autopoietic eukaryotes were prepared by Bahadur in 1967.

It was observed that when a mixture of Jeewanu and water is exposed to sunlight, water is split up into H_2 and O_2 . But due to the nitrogenase like activity of Jeewanu, the produced hydrogen is utilized in the fixation of nitrogen.

The hydrogen produced by the splitting of water is also utilized in the reduction of inorganic carbon.

Khare prepared boron molybdenum Jeewanu in 1989 which showed significant water splitting.

The presence of certain transitional metal ions e.g. Mn, Co, Zn, Cu and Fe individually in the parental environmental medium of molybdenum Jeewanu activated the water splitting ability of molybdenum Jeewanu.

In this paper, the effect of addition of varying concentrations of zinc sulphate in the PEM on the pH and the blue colour intensity of the PEM of the BMJ24 Jeewanu both PUOC and PUAC has been investigated. An attempt has been made in this paper to study the effect of addition of varying concentrations of zinc sulphate in the PEM on the pH and the blue colour intensity of the PEM of the BMJ24 Jeewanu prepared both under oxygenic and anoxygenic conditions.

KEYWORDS: Jeewanu, BMJ24, PEM, $ZnSO_4$, autopoietic, eukaryotes, exposure, Mineral solution, sunlight, PUOC, PUAC, pyrogallol, pH, blue colour.

I. INTRODUCTION

The route for which basic molecular building blocks such as amino acids and nucleobases were joined in a proper and controlled way in order to make the first active biopolymers during primitive Earth is an intriguing question for scientists in the area of the prebiotic chemistry.

Simple self-assembly supra-molecular structures which can exhibit behaviors that mimic real cells could have played a key role in the emergence of life on Earth.

According to Bahadur and Ranganayaki the earliest living cells was very simple in structure and were full of the properties of biological order. (Bahadur, K and Ranganayaki, S, 1964). [1] To tackle the problem of origin of life, it is essential to know how this earliest cells were synthesized under natural conditions. The molecular or the Chemical Evolution Theory given by Haldane (1929) [2] and Oparin (1924) [3] is the basis of the modern approach to the problem of 'Origin of life'. Bahadur in 1967 suggested that the way in which the systems organize themselves with properties of biological order is very important feature of the study of origin of life. (Bahadur, 1967). [4] The problem

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of origin of life in investigated basically in order to find out the natural condition under which the replicating, self-sustaining systems were produced. (Blum, 1961, Bahadur and Ranganayaki, 1966). [5,6]

The origin of life can be approached the best way if life and the living systems are considered in the light of functional properties. (Bahadur and Ranganayaki, 1980).[7]

It was observed that when a mixture of Jeewanu and water is exposed to sunlight, water is split up into H_2 and O_2 . But due to the nitrogenase like activity of Jeewanu, the produced hydrogen is utilized in the fixation of nitrogen. Kumar in 1982 estimated the fixed nitrogen of the exposed mixture and thus confirmed the fixation of nitrogen by Jeewanu chemically. (Kumar, 1982). [8] The hydrogen produced by the splitting of water is also utilized in the reduction of inorganic carbon. (Smith et al, 1981). [9] They observed that on exposure to light from a mercury lamp, the aqueous mixture of Jeewanu, $NaHCO_3$ and water shows the appearance of ^{14}C in the organic material.

It was observed that the presence of certain transitional metal ions e.g. Mn, Co, Zn, Cu and Fe individually in the parental environmental medium of molybdenum Jeewanu activated the water splitting ability of molybdenum Jeewanu. (Bhattacharya, 1982). [10]

Khare, Y, (1989) studied the effect of addition of zinc to the PEM of 1. $\frac{1}{2}$: 3: 1: 2: 1:1: $\frac{1}{4}$ BMJ24 Boron Molybdenum Jeewanu and reported that that the PEM having 10 mg of zinc sulphate per 107.5 ml of PEM showed maximum number as well as maximum size of the particles formed. He further observed that the particles produced are less efficient in the splitting of water but more efficient in the fixation of nitrogen. (Khare, Y, 1989). [11]

Bahadur and Ranganayaki (1970) have observed that the organo- molybdenum microstructures are able to split water into hydrogen and oxygen in presence of sunlight and fix molecular nitrogen. [12]

It was observed that addition of sodium chloride in the PEM of BMJ24 Jeewanu, produced particles of larger size and the hydrogen ion formation increased with period of exposure. (Srivastava, D., 1991)[13].

Effect of variation in the concentration of mineral solution, formaldehyde and ammonium molybdate on pH and colour intensity of the PEM of 1.531211 SMJ38 Jeewanu before and after exposure to sunlight was studied by Srivastava, D.[14] - [18]

Effect of irradiation of 1.5312211SMJ29 Silicon Molybdenum Jeewanu PEM with clinical mercury lamp and sunlight on the morphology of the silicon molybdenum Jeewanu was studied by Srivastava. [19]

Effect of addition of Methanol and Ammonium Molybdate to(0+15):30:10:20:10:10 SMJ8 Jeewanu on the morphology, pH and colour intensity of the PEM of the Jeewanu both before and after Exposure to Sunlight up to a Total of 32 Hours was studied by Srivastava, D. [20,21]

Variation in the blue colour intensity and the pH of the PEM of 1.531211SMJ29 silicon molybdenum Jeewanu when the PEM is irradiated with clinical mercury lamp and sunlight” was studied by Srivastava, D. [22]

Srivastava, D., “Study of the effect of addition of Sodium Chloride on the pH and blue colour intensity of the PEM of the BMJ24 Jeewanu” was studied by Srivastava, D. [23]

Study of the effect of NaCl addition on the functional properties of BMJ24 (PUOC) in water and in phosphate buffer of pH 6, 7 and 8 under oxygenic conditions was studied by Srivastava, D. [24]

Study of the effect of NaCl addition to the PEM on the functional properties of BMJ24 Jeewanu prepared under oxygenic conditions (PUOC) in water and in phosphate buffer of pH 6, 7 and 8 under anoxygenic conditions was studied by Srivastava, D. [25]

Study of the effect of NaCl addition to the PEM on the functional properties of BMJ24 Jeewanu prepared under anoxygenic conditions (PUAC) in water and in phosphate buffer of pH 6, 7 and 8 under anoxygenic conditions was studied by Srivastava, D. [26]

In this paper, the effect of addition of varying concentrations of zinc sulphate in the PEM on the pH and the blue colour intensity of the PEM of the BMJ24 Jeewanu both PUOC and PUAC has been investigated.

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II. RELATED WORK

Yogesh Khare (1989) prepared boron molybdenum Jeewanu and reported that addition of sodium borate in the PEM in which Jeewanu are prepared, decreased the size of the Jeewanu and increased their number. (Khare, Y, 1989) [11]. It has further been observed that the BMJ Jeewanu shows significant water splitting.

Bahadur and Ranganayaki (1970) have observed that the organo- molybdenum microstructures are able to split water into hydrogen and oxygen in presence of sunlight and fix molecular nitrogen. [12]

Sodium chloride is widely distributed in nature. About 2.8% sodium chloride is found dissolved in sea water and it is a common constituent of the living cells.

It was observed that addition of sodium chloride in the PEM of BMJ24 Jeewanu, produced particles of larger size and the hydrogen ion formation increased with period of exposure. (Srivastava, D., 1991) [13].

Study of the effect of NaCl addition on the functional properties of BMJ24 (PUOC) in water and in phosphate buffer of pH 6, 7 and 8 under oxygenic conditions was studied by Srivastava, D. [24]

III. EXPERIMENTAL RESULTS

PROCEDURE:

The following solutions were prepared:

- 1) 4% (w/v) ammonium molybdate
- 2) 3% (w/v) diammonium hydrogen phosphate
- 3) **Mineral solution:** It was prepared by mixing appropriate proportions of different minerals.
- 4) 36% formaldehyde
- 5) 3% (w/v) sodium chloride solution,
- 6) 5% (w/v) sodium borate solution
- 7) In order to study the effect of zinc on the properties of the BMJ24 Jeewanu a solution of 100 mg of zinc sulphate in 100 ml of distilled water was prepared in addition to the other usual solutions.

Each solution, except formaldehyde, was sterilized in an autoclave at 15 lbs for 15 minutes.

Preparation of alkaline pyrogallol

0.15 ml of 30% aqueous solution of sodium hydroxide and 0.15 ml of 20% aqueous solution of pyrogallol were mixed and thus the alkaline pyrogallol was prepared.

Eight clean, sterilized, dry corning conical flasks of 250 ml capacity were taken and marked from 1 to 8. In each of them, 30 ml of ammonium molybdate solution, 60 ml of diammonium hydrogen phosphate solution, 20 ml of mineral solution, 40 ml of 36% formaldehyde solution, 20 ml of sodium chloride solution and 20 ml of sodium borate were taken. Then the zinc sulphate was added to each flask as follows:

Flask number	1	2	3	4	5	6	7	8
Volume of ZnSO ₄	0	5	10	20	0	5	10	20

Then in each of the flask labeled 5,6,7 and 8 a test tube half filled with alkaline pyrogallol was kept in such a manner that it stands erect and the solution within the test tube and outside the test tube do not get mixed up. The total volumes of flask number 1, 2, 3, 4, 5, 6, 7 and 8 were 190 ml, 195 ml, 200 ml, 210 ml, 190 ml, 195 ml, 200 ml and 210 ml respectively. The percentage by weight of ZnSO₄ in flasks 1 to 8 were 0%, 0.26%, 0.5%, 0.95%, 0%, 0.26%, 0.5%, 0.95% respectively. Then flask numbers 1 to 4 were cotton plugged and flask number 5 to 8 were plugged tightly with

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rubber cork. Each flask was shaken gently by whirling motion and exposed to sunlight for a total of 24 hours giving four hours exposure daily.

After 4 hours, 8 hours, 12 hours, 16 hours, 20 hours and 24 hours of exposure, the pH and the blue colour intensity of the PEM were recorded for flask number 1 to 4. But for flask number 5 to 8, observations were made only after 24 hours of exposure to maintain the anoxygenic condition within the flasks.

OBSERVATIONS

TABLE – 1

Effect of different concentrations of ZnSO_4 in the PEM of 1.531211 BMJ24 Jeewanu on the yield of the solid material formed in g.

Condition	Yield of the solid material formed in the PEM in g			
	Percentage of ZnSO_4 added to the PEM			
	0	0.20	0.50	0.95
Oxygenic	1.0386	0.3880	0.2846	1.0528
anoxygenic	1.0752	0.9354	0.9070	1.1910

TABLE – 2

Effect of different concentrations of ZnSO_4 in the PEM of the BMJ24 Jeewanu (PUOC) on the reduction of Mo_{6+} to Mo_{4+} with increasing period of exposure.

Period of exposure in hours	Colorimetric readings			
	Percentage of ZnSO_4 added to the PEM			
	0	0.26	0.5	0.95
4	212	210	232	216
8	254	228	240	235
12	300	256	284	260
16	335	300	305	288
20	315	238	296	270
24	315	260	220	290

TABLE-3

Effect of different concentration of ZnSO_4 in the PEM of the BMJ24 Jeewanu (PUOC) on the pH of the PEM with increasing period of exposure.

Period of exposure in hours	Percentage of ZnSO_4 added to the PEM			
	0	0.26	0.50	0.95
4	2.65	2.61	2.62	2.67
8	2.47	2.42	2.48	2.52
12	2.21	2.23	2.28	2.36
16	2.43	2.39	2.39	2.43
20	2.31	2.30	2.34	2.38
24	2.36	2.35	2.38	2.40

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TABLE-4

Effect of addition of different concentrations of ZnSO_4 to the PEM of 1.531211 BMJ24 Jeewanu (PUAC) on the pH and the blue colour intensity of the PEM with increasing period of exposure.

Period of exposure in hours	Reading	Percentage of ZnSO_4 added to the PEM			
		0.00	0.26	0.50	0.95
24	Colorimetric	330	226	210	238
	pH	2.47	2.44	2.46	2.50

IV. CONCLUSION

Increase in the intensity of the blue colour was observed for the first 16 hours of exposure. Then there was a mild decrease followed by a slight increase in the absorbance in all the four cases of PEM the one with no additional ZnSO_4 , and also with 0.26, 0.50 and 0.95% ZnSO_4 , under oxygenic conditions. However, the PEM with 0.58% ZnSO_4 showed least intensity of the blue colour.

Under anoxygenic conditions, after 24 hours of exposure except in PEM having no additional ZnSO_4 , in all the other mixtures, the intensity of the blue colour decreased slightly as compared to the intensity of the blue colour after 24 hours of exposure in PEM prepared under oxygenic conditions.

There was a rapid fall of pH up to 12 hours of exposure, there after there was a slight increase in the pH. This was true for all the cases of PEM with no ZnSO_4 and PEM with 0.26%, 0.50% and 0.95% ZnSO_4 . As the concentration of ZnSO_4 in the PEM increased, the fall in the pH with increasing exposure time decreased. Minimum fall in the pH was observed in PEM with 0.95% ZnSO_4 . In all the cases it was observed that the pH under anoxygenic conditions was slightly higher than that under oxygenic conditions or in other words, there was greater increase in the acidity of the PEM under oxygenic conditions in all the four cases.

Thus it can be inferred that as the number of the particles formed in the PEM increased, the intensity of the blue colour increased but the pH decreased with increasing exposure time. Further observation was that when 0.26% or 0.50% of additional ZnSO_4 was present, the number of the particles decreased along with corresponding decrease in the intensity of the blue colour of the PEM after 24 hours of exposure, showing less reduction of Mo^{6+} to Mo^{4+} . But when 0.95% ZnSO_4 was present, the number of the particles as well as the intensity of the blue colour increased. It was observed that as the concentration of the additional ZnSO_4 increased, the fall in the pH of the PEM, with increasing period of exposure, decreased showing that presence of additional ZnSO_4 in PEM reduces the acidity of the PEM gradually. As ZnSO_4 in solution is slightly acidic, there is some other reaction taking place which is reducing the acidity of the exposed mixture which might be due to the fixation of molecular nitrogen in ammoniacal form. Rati Mehta observed that in a closed system of 1211MJ Jeewanu exposed to sunlight in a Warburg's flask a decrease in pressure was observed indicating fixation of nitrogen and this shows that the alkalinity of the mixture increases on exposure. (Mehta, R, 1984).[27]

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REFERENCES

- [1] Bahadur, K. and Ranganayaki, S., Zbl. Bakt. 117(2), pp 567, 574, 1964.
- [2] Haldane, J.B.S., Rationalist Ann.: Science and Human Life, Harper Bros, New York and London, (1933), pp 148-49, 1929.
- [3] Oparin, A.I., Proiskhozhdenie zhizni, Izd.Moskovskii Robochii, Moscow, 1924.
- [4] Bahadur, K., Zbl. Bakt. 121(2), pp 291-319, 1967.
- [5] Blum, H.F., American Scientist, 49(4), pp 474-479, 1961.
- [6] Bahadur, K. and Ranganayaki, S., Vijanana Parishad Anusandhan Patrika, 9(4), pp 171-82, 1966.
- [7] Bahadur K. and Ranganayaki S., "Origin of life, a functional approach", M/S Ram Narain Lal and Beni Prasad, Allahabad, India, 1980.
- [8] Kumar, S., "Studies in the Photochemical Molecular Evolution in Aqueous Systems", D.Phil. Thesis, Dept. of Chem. Univ. of Allahabad, Allahabad, India, 1981.
- [9] Smith A.E., Folsome C. and Bahadur K., Experientia, 37, pp 357, 1981.
- [10] Bhattacharya, S., "The study of Cytology of the primitive autotrophs", D.Phil. Thesis, Dept. of Chem. Univ. of Allahabad, Allahabad, India, 1982.
- [11] Khare, Y., "Photochemical Splitting of Water by Organo- Molybdenum Jeewanu", D.Phil. Thesis, Dept. of Chem. Univ. of Allahabad, Allahabad, India, 1989.
- [12] Bahadur, K. and Ranganayaki, S. (1970), J. Brit. Interplanetary Soc., Vol. 23(12), 813-829.
- [13] Srivastava, D., "Study of the kinetics of Jeewanu the Autopoetic Eukaryote", D.Phil. Thesis, Dept. of Chemistry, Univ. of Allahabad, Allahabad, India, 1991.
- [14] Srivastava, D., "Study of the Effect of Variation in the Concentration of Mineral Solution in the PEM of 1.531211SMJ 38 before and after Exposure to Sunlight, on Morphology of 1.531211 SMJ 38". Int J Recent Sci Res. 7(4), pp. 10648-10651, 2016.
- [15] Srivastava, D., "Effect of variation in the concentration of mineral solution on pH and colour intensity of the PEM of 1.531211 SMJ38 Jeewanu before and after exposure to sunlight", International Journal of Innovative Research in Science, Engineering and Technology (An ISO 3297: 2007 Certified Organization), (IJIRSET), vol. 5, Issue 5, May 2016, pp 8065 8068. DOI: 10.15680/IJIRSET. 2016. 0505111, 2016.
- [16] Srivastava, D., "Effect of Addition of Higher Concentration of Mineral Solution in the PEM on the colour intensity and the pH of the PEM during the formation of the Silicon Molybdenum Jeewanu SMJ8", Journal of International Academy of Physical Sciences, Vol. 14 No.1 (2010), pp. 131-136, 2010.
- [17] Srivastava, D., "Effect of increase of concentration of formaldehyde in the PEM of 1.531211 SMJ8 on the proton release and degree of Mo^{6+} reduction to Mo^{4+} during the exposure to sunlight", Journal of Natural Research(IISTE), Vol 2, No.7, 2012, pp 56-59, 2012.
- [18] Srivastava, D., "Effect of variation in the concentration of ammonium molybdate in the parental environmental medium (PEM) on the pH and the photochemical reduction of Mo^{6+} to Mo^{4+} in the PEM of the Silicon Molybdenum Jeewanu 1.531211 SMJ8 both before and after exposure", International Journal of Scientific and Engineering Research (IJSER), Vol 3, Issue 6, June-2012, pp750-754. DOI: 10. 14299/000000, 2012.
- [19] Srivastava, D., "Effect of irradiation of the PEM of 1.531211SMJ29 Jeewanu with clinical mercury lamp and sunlight of the morphological features of the silicon molybdenum Jeewanu", International Journal of Engineering Research and General Science (IJERGS), Vol. 4, Issue 4, pp.372-376, 2016.
- [20] Srivastava, D., 2016, "Morphological changes in (0+15):30:10:20:10:10 SMJ8 Jeewanu on adding methanol and ammonium molybdate to the PEM of the Jeewanu both before and after exposure to Sunlight up to a total of 32 hours" published in International Journal of Advanced Research (Int.J.Adv.Res.), ISSN: 2320-5407, vol.4, issue 8, 2016, pp1612-1614. DOI: 10.21474/IJAR01/1370.
- [21] Srivastava, D., "Effect of addition of Methanol and Ammonium Molybdate to (0+15):30:10:20:10:10 SMJ8 Jeewanu on the pH and colour intensity of the PEM of the Jeewanu both before and after Exposure to Sunlight up to a Total of 32 Hours", International Journal of Innovative Research in Science, Engineering and Technology (An ISO 3297: 2007 Certified Organization), (IJIRSET), vol. 5, Issue 8, August 2016, page15500-15504. DOI: 10.15680/IJIRSET. 2016. 0508201, 2016.
- [22] Srivastava, D., "Variation in the blue colour intensity and the pH of the PEM of 1.531211SMJ29 silicon molybdenum Jeewanu when the PEM is irradiated with clinical mercury lamp and sunlight" published in International Journal of Engineering Research and General Science (IJERGS), ISSN: 2091-2730, Vol. 4, Issue 5, pp.22-25, 2016.
- [23] Srivastava, D., "Study of the effect of addition of Sodium Chloride on the pH and blue colour intensity of the PEM of the BMJ24 Jeewanu" published in International Journal of Innovative Research in Science, Engineering and Technology (An ISO 3297: 2007 Certified Organization), (IJIRSET), vol. 5, Issue 9, September 2016, pp 16819-16824. DOI: 10.15680/IJIRSET. 2016.0509044, 2016.
- [24] Srivastava, D., "Effect of NaCl addition to the PEM on the functional properties of BMJ24 Jeewanu prepared under oxygenic conditions (PUOC) in water and in phosphate buffer of pH 6, 7 and 8 under oxygenic conditions." published in International Journal of Innovative Research in Science, Engineering and Technology (An ISO 3297: 2007 Certified Organization), (IJIRSET), vol. 5, Issue 10, October 2016, pp 18666-1871. DOI: 10.15680/IJIRSET. 2016.0510088., 2016.



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- [25] Srivastava, D., "Study of the effect of NaCl addition to the PEM on the functional properties of BMJ24 Jeewanu prepared under oxygenic conditions (PUOC) in water and in phosphate buffer of pH 6, 7 and 8 under anoxygenic conditions." published in International Journal of Innovative Research in Science, Engineering and Technology (An ISO 3297: 2007 Certified Organization), (IJIRSET), vol. 5, Issue 11, November 2016, pp 20046-20052. DOI: 10.15680/IJIRSET.2016.0511081,2016.
- [26] Srivastava, D., "Study of the effect of NaCl addition to the PEM on the functional properties of BMJ24 Jeewanu prepared under anoxygenic conditions (PUAC) in water and in phosphate buffer of pH 6, 7 and 8 under anoxygenic conditions." published in International Journal of Innovative Research in Science, Engineering and Technology (An ISO 3297: 2007 Certified Organization), (IJIRSET), vol. 5, Issue 12, December 2016, pp 21135-21140. DOI: 10.15680/IJIRSET.2016.0512040,2016.
- [27] Mehta, R. "Study of the photolytic dissociation of water by Jeewanu, the Primitive Autotrophs", D.Phil. Thesis, Dept. of Chem. Univ. of Allahabad, Allahabad, India,1984.