

The synthesis of primitive surface protein by interaction among molecules at juxtamembrane in the water

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[Hydrogen ion concentration of water in the early Earth]

Sea water in the early Earth contained iron atoms (Fe). There was carbon dioxide and nitrogen gas in the sky. **Solubility of the CO₂ gas large. But the degree of ionization is 0.017, i.e. 98.3% of the dissolved CO₂ is molecules.**

Time dependency on CO₂ dissolved in water was estimated by the values of pH meter as shown in Fig.1.

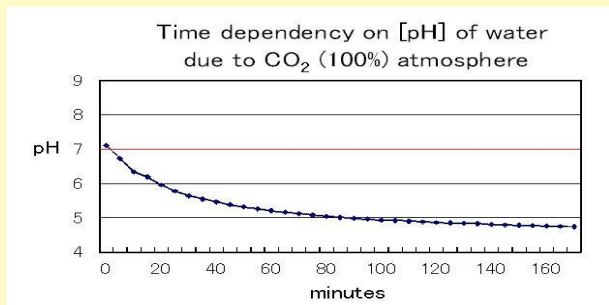


Fig.1 Time dependency on pH of water (100cc) under 1 atm of CO₂

The reaction of iron powder (Fe;5g) with carbonated water (100cc) is very slow as shown in Fig.2.

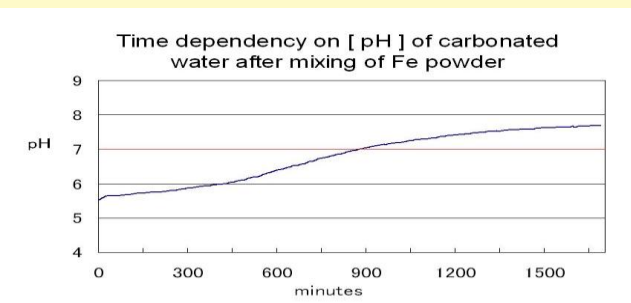


Fig.2 Time dependency on pH of carbonated water with powder of Fe

[Effects of thermal motion of molecule in water on chemical reactions]

Neighboring atoms of liquid have been swapped by thermal motion. The state of electron varies by neighboring atoms. The reaction occurs when the conditions are satisfied. That is a selectivity of reaction. Thermal motion becomes small, if the molecules are synthesized. Thermal motion becomes large, if the molecule is resolved. The thermal motion has an effect of positive feedback for the synthesis of molecules in wet process.

[Existence of membrane promotes peptide bond of amino acids]

Although amino acid is soluble in water, it is insoluble in oil. The side chain of the amino acid is concerned with the attachment to membrane. Synthesis of protein due to peptide bonds occurs the dehydration between (-NH₂) and (-COOH) under neutral state (pH=7). The thermal motion of amino acid is suppressed by the connection to the membrane. It suppresses resolution of the peptide bond.

[Cooperative evolution on the surface protein and membrane]

The protein and membrane had been evolved cooperatively. Since there are great many molecules in a membrane, a great long molecule of protein will be synthesized on the surface. The synthesis of peptide bond on amino acids i.e. primitive surface protein enhances robustness of the membrane. The long life promotes the synthesis.

[Experiments that found the conditions for peptide bond of amino acids]

Solid material such as liposome was generated at the intermediate layer in near neutral state of the water that contains CO₂, Fe and amino acids as shown in Fig.3. The components of the amino acids are Glutamine143mg, Valine36mg, Leucine71mg, Isoleucine36mg, Ornithine36mg, Citrulline36mg, Glucosamine14mg, Citric acid71mg.



(a) Alkaline state [Fe ion is excessive]

(b) Neutralization state by CO₂ gas

(c) Neutral state (pH=7)

(d) Acidic state [CO₂ is excessive]

Fig.3. Forming of solid materials under various acidity in H₂O with CO₂, Fe and amino acids

[The mechanism that produces liposome]

Large bubble is formed by coalescence of small bubbles. When a micelle touches the surface of the water,

it creates a liposome by breathing the water together with the membrane.

The membrane of liposome is produced by the mechanism similar to produce the micelle. A large cell of liposome is able to include another liposome in it.

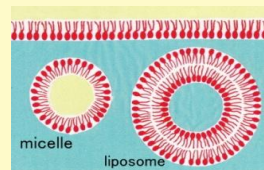


Fig.4. 3 kinds of membrane

[The evidences those indicate synthesis of protein]

- (1) The membrane, that is produced from H₂O, CO₂ and Fe, becomes soluble in water by excess addition of amino acid.
- (2) Liposome did not produce if there is not an amino acid.
- (3) Liposome was produced at the neutral state when the acidic state was changed from alkaline to acidic, and it was changed from acidic to alkaline.

[Conclusions]

The hypothesis that primitive protein was synthesized from inorganic substances was verified. A primitive protein was made by amino acids those attached to the membrane that had been made from carbonated water with Fe[1].

[References]

- [1] S. Karasawa, "Inorganic production of membranes together with iron carbide via oxidation of iron in the water that includes carbon dioxide plentifully", AbSciCon2010, Pre-biotic Evolution: From Chemistry to Life II, League City, Texas, Apr.27, 2010.