INORGANIC PRODUCTION OF MEMBRANES TOGETHER WITH IRON CARBIDE VIA OXIDIZATION OF IRON IN THE WATER THAT INCLUDES CARBON DIOXIDE PLENTIFULLY

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Introduction: The iron carbide (Fe_3C, Fe_4C) has been investigated to assist the Fischer-Tropsch (FT) reaction for synthesizing hydrocarbons. There is a report on synthesis of iron carbide nano-particles using CO_2 laser pyrolysis technique [1]. As a CO_2 reduction technology, the iron carbide was made for fixation of CO_2 with iron fine particles (grain size 3.8 μ m) at high temperature (600~900K) [2].

This paper reports experimental results, which indicate iron carbide is made from CO_2 dissolved in water by deoxidgenation that is caused by oxidation of Fe. This result explains the hypothesis of abiogenic organic chemicals origin at early earth, because the sea water at early earth had dissolved plentiful CO_2 and plentiful Fe [3]. The electronegativity of carbon (C) is larger than that of hydrogen (H). So, the Fe takes oxygen (O) atom from CO_2 in the water, and the C atom bonds to Fe atom. The iron carbide has a tendency to decompose in water. After that, oxidation of Fe in the iron carbide in water makes iron oxides and organic materials such as hydrocarbons.

Preparations: After about 24 hours from addition of steel wool (shown in Fig.1-a), floating materials (shown in Fig.1-b) appear on the surface of saline water in which CO_2 was solved with high density.

a) Steel wood used for deoxidgenation

b) Floating materials used for analyses

Fig.1 Materials obtained by addition of steel wool into the water in which CO_2 was solved with high density.

Analyses by FT-IR: Fourier Transform Infrared Spectroscopy (FT-IR) is a tool for identifying types of chemical bonds in a molecule by producing an infrared absorption spectrum. The result is shown in Fig.2.

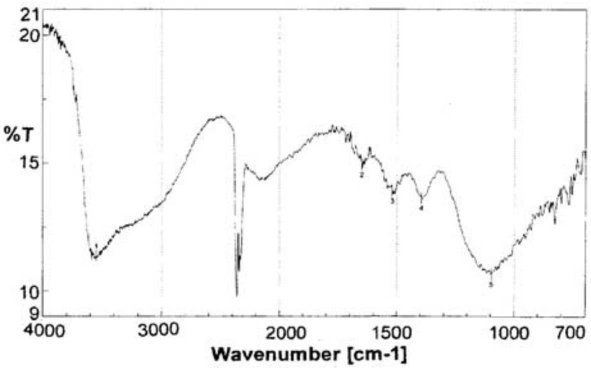

Fig.2. FT-IR analysis on the floating materials shown in Fig.1 indicates absence of chemical bond of C-H. But there exists bond of H_2O and that of CO_2.

Analyses by EDS: Energy dispersive X-ray spectroscopy (EDS) is an analytical technique used for the elemental analysis or chemical characterization of a sample. The EDS is commonly equipped with scanning electron microscopes (SEM). Mapping for EDS analysis is carried out by the SEM as shown in Fig 3.

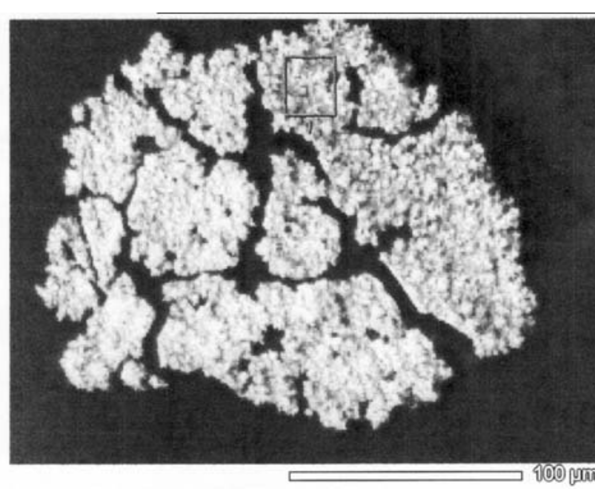

Fig.3 The mapping for EDS analysis by SEM(x500). A small square indicated in Fig.3 is region (1).

Fig.4 shows an example of EDS spectrum. The peaks are labeled with the line of the corresponding element.

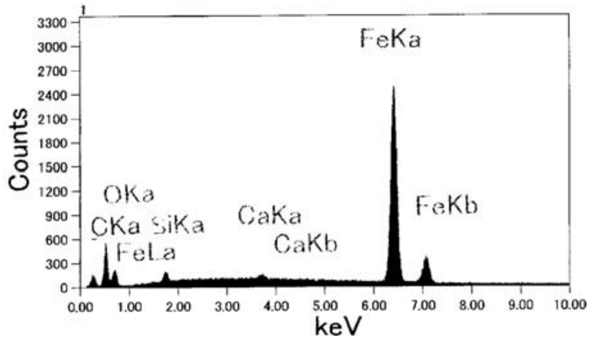

Fig. 4. EDS X-ray spectrum for region (1).

The spectrum of x-ray energy versus counts is evaluated to determine the elemental composition of individual volume. The data obtained by EDS are listed in Table 1, 2, 3.

Table 1 EDS analysis on region (1)

Element	keV	Mass %	Error	Number of atom %
C	0.277	3.14	0.11	11.7
O	0.525	4.94	0.10	13.83
Si	1.739	0.77	0.13	1.23
Ca	3.690	0.47	0.17	0.53
Fe	6.398	90.682	0.48	72.71

Table 2 EDS analysis on region (2)

Element	keV	Mass %	Error	Number of atom %
C	0.277	3.75	0.10	12.61
O	0.525	9.30	0.09	23.46
Si	1.739	1.33	0.13	1.91
Ca	3.690	0.61	0.17	0.62
Fe	6.398	85.00	0.46	61.41

Table 3 EDS analysis on region a(3)

Element	keV	Mass %	Error	Number of atom %
C	0.277	7.19	0.09	22.01
O	0.525	9.74	0.09	22.38
Si	1.739	1.23	0.11	1.61
Ca	3.690	0.52	0.16	0.48
Fe	6.398	81.32	0.43	53.52

The data indicate that iron carbide (Fe_nC) is made from CO_2 dissolved in water by deoxidgenation that is caused by oxidation of Fe. That is mole fraction of iron carbide is different from the general value of valence. The iron carbide is intermediate chemicals.

Abiogenic production of membrane: Irradiation of ultraviolet rays on the materials obtained by addition of steel wool into the water in which CO_2 was solved with high density makes a membrane as shown in Fig.5.

Fig. 5. The membrane that is obtained by irradiation of ultraviolet rays. The membrane is easy to break.

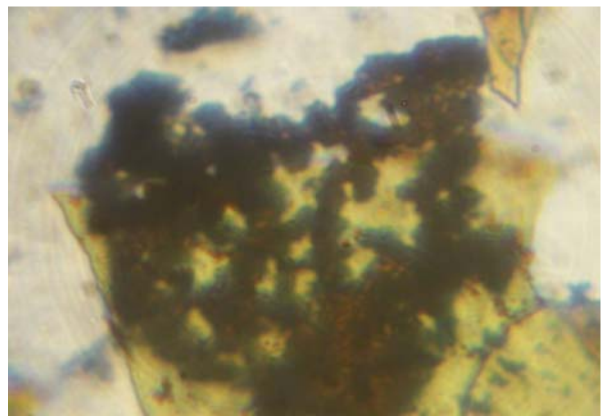

Fig. 6. The dried membrane was made through irradiation of ultraviolet rays (photomicroscope x600)

Results and Future Work: Membrane materials are obtained by adding iron fiber into the water in which CO_2 was solved with high density. The deoxidization of CO_2 is carried out by the oxidization of Fe in the water. Hydrogen atom (H) in H_2O changes to H^+ at the oxidation of Fe. H^+ becomes the energy source of an organic reaction, because it is able to excite an atom by receiving an electron. The density difference of H^+ brings the potential difference. The potential difference results in the flow of H^+. The flow is able to transfer the other ion. H^+ is available as driving force for activities of life.

References: [1] Xiang-Xin Bi, B. Ganguly, G. P. Huffman, F. E. Huggins, M. Endo and P. C. Eklund. **(**1993**)** Journal of Materials**.** Research**,** Vol.8**,** No.7**,** pp.1666-1674**,.** [2] T. Sakurazawa, S. Yuasa, (2006) Combustion Society of Japan, Simp44, 438-439. [3] S. Karasawa, (2009) Viva Origino Vol.37 Supplement, 6.