

The synthesis of organic substance through the deoxidization of carbon dioxide by oxidation of iron

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The ultra-fine iron powder (Fe) does not oxidized in the gas state of carbon dioxide, it oxidized by mixing of dry ice (CO₂) [1]. This phenomenon of the low temperature as -70 °C is explained by the mechanism that the chemical reaction by replacement of adjacent atoms is realized at the contact between solid state of carbon dioxide and metal of iron. Here, the oxidation of iron by carbon dioxide is exothermic. But, the reduction of iron oxide by carbon is endothermic.

The ultrafine powder of iron is made by heating of oxalic acid iron (FeC₂O₄ · 2H₂O). In case of mixing carbon dioxide gas with this powder, immediately noticeable reaction does not happen. However, when the ultra-fine powder of iron is put onto the dry ice, the reaction occurs [1]. There are rare ignitions at scattering the ultra-fine powder of iron onto the dry ice. After a while, smoke is generated from the mixture. The reddish tinge smoke is seen often.

The oxidation of iron produces iron(II)oxide (FeO). The oxidation of iron(II)oxide produces iron(III)oxide (red iron oxide: Fe₂O₃). At the oxidation of iron by carbon dioxide, the carbon dioxide loses oxygen atoms. This is reverse reaction of production of steel from iron oxide with carbon.

The fact that the chemical reaction of metal becomes easy by minimization of the particle is caused by the metallic bond. That is, close approach of many metal atoms will form an energy band structure. And the lower energy levels among the band states will be occupied by electrons. The atom of metal is linked by the cooperation of the cohesive force. But, the isolation of each atom from the solid state is not necessary in case of exchanging the atoms at the contact of solids.

On the other hand, carbonated water is able to oxidize iron. Here, the iron is oxidized by the oxygen that comes from the carbon dioxide instead of the water, owing to the larger electronegativity of carbon than that of hydrogen. Therefore, the remaining carbon atoms are connected with water molecules.

Thus various organic compounds are synthesized from inorganic materials of carbon dioxide, iron and liquid water. By replacing the atoms of organic compounds, it becomes possible to form the organization of molecules that adapts to the changing situation. The chemical reactions by exchange of atoms for the low energy barriers is necessary for the birth of life. The reaction of metabolism in a living body is carried out by the exchanging of the adjacent atoms.

[Reference]

[1]: Oxidation of ultra-fine iron particles by solid state of carbon dioxide-A chemical reaction by exchange of atoms- <https://youtu.be/0qchcYRxuG4>

[2] S. Karasawa, Prebiotic reactions in the bubble that was formed in carbonated water by iron atoms, Viva Origino 42 (2014) pp. 12 – 17.