

Increase in trivalent iron elution amount and iron compounds from fayalite by ultraviolet C

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In order to explain one of the causes of the large amount of iron oxide on the surface of Mars, the following experiment was conducted by a science club at my junior high school. Ultraviolet rays C was applied to fayalite in hydrochloric acid and sulfuric acid which had been degassed to pH2 as much as possible. Fayalite we used is from Kawamata-machi, Fukushima Prefecture. We selected similarly shaped fayalite and weighted ones at a weight of 1g. These fayalite samples were immersed in acidic aqueous solution in test tubes. Then, ultraviolet rays were irradiated for 200 hours or longer. Every few days, the concentration of total iron ions and trivalent iron ions in the aqueous solution were measured using a digital pack test. Ultraviolet rays C are generated by a germicidal lamp. This peak wavelength is 245 nm and the ultraviolet intensity is about 20 W / m².

The results of this experiment showed that, the concentration of trivalent iron ions in the acidic aqueous solution was significantly increased more than the ones that were not irradiated by ultraviolet rays. Also, the ratio of the trivalent iron ion concentration to the total iron ion concentration was larger when it was radiated by ultraviolet rays. We conducted this experiment three times and the results came to be the same for all three experiments. Also, after the experiment, more brown fine powder was generated in the test tube irradiated with ultraviolet rays than not irradiated. According to the result of X-rays diffraction, this brown powder seemed to be mostly made from non-crystallized brown fine powder. Furthermore in the case of hydrochloric acid, it turned out that this brown powder contained Lawrenceite and goethite. Similarly, in the case of sulfuric acid, we found out that metahohmannite and alum were contained.

For the results mentioned above, we can say that ultraviolet rays C increases the concentration of trivalent iron ions eluted from rocks immersed in an aqueous solution and increases the amount of iron compounds. Iron oxide and sulfate minerals have been found on Mars. It is presumed that ultraviolet rays C from the sun promoted the production of these minerals in the past when the Martian sea dried up.

Keywords: ultraviolet C, acidic aqueous solution, trivalent iron, mars, goethite, metahohmannite

