Q&A

22Q1: Row Water contains high concentration lime. Can lime be removed by the bio-filtration method?

Dr. Nakamoto* explains that the biological filter of slow sand filtration effects to soften the hard water by following processes,

Adsorption of nutritional salts → ***Creation of oxygen***

→ ***Separation of calcium carbonate*** → ***Softening hard water***

Does "softening hard water" mean that the calcium in the water is also removed by slow sand filter? (Mr. K、in Bhutan)

*** President of the community water supply support center of Japan, a NPO and a professor emeritus of Shinsyu University, Japan**

A1: I tried to an experiment of slow sand filtration in Bolivia. I checked the quality of the water. The hardness of each well-water, river-water, reservoir-water is about 100mg-CaCo3. So hardness is not treated. The book of Professor Nakamoto indicates that it is the example of the water purification plant of MIYAKOJIMA. This is the blog of Professor Nakamoto. http://blogs.yahoo.co.jp/cwscnkmt/31603065.html
In this example, it could be seen as the calcium was caught by the algae in the filtration. However it is not show the detail data, so I can't clearly say that slow sand filtration can purify right here.
(Answerer: Mr. HORIE Toshiki, Graduate School of Tokyo Metropolitan University, 2010)

A2: There is an actual case of calcium removal by the slow sand filter. I did not know. However, I think, even high concentrated calcium in the water is removed by changing lime to calcium carbonate in short period, film of calcium carbonate is produced on the surface of sand. And the film may cause clog of the filter. Because I don't have the experience of slow sand filter, I cannot say clearly. But, when algae glow and photosynthesis work well, carbonic components are consumed. And then calcium volume which settles down as calcium carbonate, will reduce. I think, as the condition of water-flowing, slow sand filtration method doesn't work to reduce calcium dramatically until the level of "lime removal", without plural bio-filter system
(Answerer: Mr. SASAYAMA Hiroshi, Yokohama City Waterworks Bureau, 2010)

Explanation of Terms

Lime: Generally, lime is calcium oxide （CaO） or /and slaked lime = hydroxide （Ca(OH)2 ） (by “Water supply terms dictionary”, Japan)

Hard water: Generally, water that requires considerable amounts of soap to produce a foam or lather and that also produces scale in hot water pipes, heaters, boilers, and other units in which the temperature of water is increased materially. With respect to hardness, waters have been classified as follows: 0–25 mg/L as calcium carbonate (CaCO3), very soft; 25–75 mg/L as CaCO3, soft; 75–150 mg/L as CaCO3, moderately hard; 150–300 mg/L as CaCO3, hard; 300 mg/L as CaCO3 and up, very hard.
(by “AWWA Drinking Water Dictionary”)

Water softening: The removal of calcium and magnesium ions, which are the principal causes of hardness in water. The cation exchange resin method is most commonly used for residential and commercial water treatment. In municipal and industrial water treatment, the process can be lime softening or lime–soda ash softening, called precipitative softening. (Ditto)

Lime softening: The process of removing water hardness by adding lime to precipitate solids composed of metal carbonates and hydroxides. Clarification may or may not also occur. (Ditto)

Lime–soda ash softening: A water treatment that makes use of lime softening followed by a reduction of noncarbonate hardness by the addition of soda ash (Na2CO3) to form an insoluble precipitate that is removed by filtration. This method of removing hardness by precipitation is sometimes used by municipalities, but it will leave 85 mg/L or more of residual hardness as calcium carbonate (CaCO3).
(Ditto)