

Phosphorus Removal by Iron Electrolysis and Its Application to Biological Wastewater Treatment

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In recent years, pollution of closed water bodies such as lakes, inland seas and inner bays has become a major issue in Japan. One of the causes of this water pollution is domestic wastewater, and it has become necessary to improve the treatment of wastewater by developing sewerage systems and / or on-site type treatment systems such as Johkaou. In these treatment systems nutrients removal became to be necessary in order to protect water quality of the closed water bodies.

As for Johkasou systems, BOD and nitrogen removal process has been widely applied in actual facilities including small-scale facilities for individual household use. However phosphorus removal process has not been actually applied to small-scale Johkasou facilities. In this study we introduced a new process for phosphorus removal that could be applied even in such small-scale facilities. Iron electrolysis method that was introduced there has been proved to be applied in Johkasou and other biological wastewater treatment. This method was also shown to be very easy to control the amount of iron dose.

It had been known in the iron electrolysis method that the oxidation film on the electrode caused difficulties for sustainable iron elution. To avoid this difficulties the reverse of the electrode polarity was introduced. By this reverse operation a long term performance of phosphorus removal was obtained. The iron elution weight was stable and the phosphorus removal efficiency was more than 80%.

The iron electrolysis was applied to biological wastewater treatment process: biofilm process and activated sludge process. As for biofilm process, applications of the iron electrolysis method to laboratory scale biofiltration tests followed by actual contact aeration facilities were carried out. The optimum conditions for phosphorus removal was examined and a good performance was obtained for six months.

From a laboratory examination of iron electrolysis applied to activated sludge process it was clear that eluted iron did not inhibit the biological activity of bacteria and iron accumulated in the activated sludge removed phosphorus in the wastewater. The iron electrolysis method was also applied to actual industrial wastewater treatment facilities showing a good performance of phosphorus removal.