Study on optimization of coagulant addition in activated sludge process for phosphorus removal

Iori Mishima

In order to control the eutrophication in lakes and estuaries, nutrient removal from wastewater is necessary. The activated sludge process with coagulant addition and the enhanced biological phosphorus removal (EBPR) process have been widely used to remove phosphorus in wastewater treatment plants. The combination of the two processes seems to be effective to reduce the amount of coagulant addition. The purpose of this study is to clarify the precise mechanism of phosphorus removal in the combination of chemical coagulation and EBPR process (the activated sludge process for phosphorus removal) and to determine the adequate amount of coagulant addition in the process.

The performance of phosphorus removal in actual wastewater treatment plants was investigated in the 2nd chapter. The relationship between coagulant content in the activated sludge and phosphorus removal efficiency was discussed. Precipitation beaker tests using ferric chloride and phosphate were conducted in the 3rd chapter. The process that phosphate in wastewater was coagulated and become to be insoluble was examined. Laboratory scale activated sludge experiments with coagulant addition were carried out in the 4th chapter. The behavior of the coagulant in the activated sludge was clarified. The EBPR experiment with coagulant addition was carried out in the 5th chapter. The coagulant effected on the phosphorus uptake and release and stabilized the phosphorus removal efficiency in the EBPR process. From the results obtained in the 2nd to 5th chapter, the phosphorus removal model was introduced in the 6th chapter. The optimum operation of coagulant addition in the activated sludge process for phosphorus removal was able to be determined with the model.