The 2024 World Congress on
Advances in Civil, Environmental, & Materials Research (ACEM24)
19-22, August, 2024, The K hotel, Seoul, Korea

The fate of Microcystin-LR in a water distribution system

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ABSTRACT

The eutrophication in a reservoir is endangering drinking water consumers by algal toxins. Microcystin, one of algal toxins, is known to be harmful to human by adversely affecting our liver and brain. In the water purification process, microcystin can be removed by reacting with hypochloric acid. It is known that removal efficiency is determined by temperature, pH, and chlorine contact. Since microcystein reacts with chlorine, its concentration continues to decrease in a clear well, distribution reservoir, and water distribution networks. Assuming an emergency in which microcystine cannot be properly removed, it is of great importance to predict that it will be removed from the network.

It is difficult to predict the removal of microsysteine from a clear well, distribution reservoir because the water level of these changes dynamically. In this study, we adopted CSTR in series model with varying reactor volume. For distribution network analysis, we used EPANET 2.2 model in a South Korean city. Kinetic parameters were obtained through a batch test with chlorine and microcystin. Microcystin decay coefficients were 0.430×10^{-3}L/mg·sec and 0.143×10^{-3}L/mg·sec for pH 7.0 and 8.1, respectively.

In this study, a simulation will be performed by several virtual scenarios for emergencies in which microcystins enter a water distribution network. This study will also conduct a simulation of removal in situations where the water level in a clear well and distribution reservoir changes. The results of this study will show how microcystine decreases in concentration in water purification systems and distribution network systems. These results will also help the efficient management of microsysin, which are toxic substances produced by eutrophication.

REFERENCES

Cero, J. L., Rodriguez, E., & Meriluoto, J. (2005). Kinetics of reactions between chlorine and the cyanobacterial toxins microcystins. Water research, 39(8), 1628-1638.

Kastl, G., Fisher, I., & Jegatheesan, V. (1999). Evaluation of chlorine decay kinetics expressions for drinking water distribution systems modelling. Aqua, 48, 219-226.

Xagoraraki, I., Zulliger, K., Harrington, G., Zeier, B., Krick, W., & Karner, D. (2006). Ct values required for degradation of microcystin-LR by free chlorine. Aqua, 55, 233-245.