

## **Study on the Mechanisms of Extra High Phosphorus Removal Capacity in Biofilm A/O-MBR System without Sludge Withdrawal**

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### **Abstract**

This study will be explored the main mechanism of the extra high phosphorus removal capacity phenomenon. It will look at the 100% removal capacity of phosphorus in a biofilm A/O-MBR system operating under an infinite SRT for treating synthetic municipal wastewater. The biofilm A/O-MBR will be designed to replace anaerobic/anoxic/oxic (A<sup>2</sup>/O) system for simultaneous nitrogen and phosphorus by using only two tanks. The system will be consisted of two compartments with the combination of an anoxic tank packed with cubic shape sponge as biofilm carrier. The investigation will be carried out based on the previous study which was found that 100% and 80% of phosphorus and nitrogen removal, respectively, could be achieved in the system when operated without sludge withdrawal and applied acetate as a sole carbon source. Based on the hypothesis that apart from the activity of PAOs (phosphate release and uptake process), EPS and sponge may also play roles in this phenomenon. Therefore, the different operating conditions will be applied to evaluate the microorganism activities and the EPS production. Moreover, microbial community dynamics and compositions of bacterial groups involving in the biological phosphorus removal and nitrification/denitrification that inhabit in the biofilm A/O-MBR system will be studied in details. In this regard, this study may reveal a new mechanism of biological phosphorus removal in the MBR process.

### **Keywords**

Membrane bioreactor; phosphorus removal; sponge addition; infinite SRT