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A novel membrane bioreactor inoculated with symbiotic sludge bacteria and algae: Performance and microbial community analysis

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Abstract

This study combined sludge MBR technology with algae to establish an effective wastewater treatment and low membrane fouling system (ASB-MBR). Compared with control-MBR (C-MBR), the amelioration of microbial activity and the improvement of sludge properties and system environment were achieved after introducing algae resulting in high nutrients removal in the combined system. Further statistical analysis revealed that the symbiosis of algae and sludge displayed more remarkable impacts on nutrients removal than either of them. Additionally, membrane permeability was improved in ASB-MBR with respect to the decreased concentration, the changed of characteristics and the broken particular functional groups of extracellular polymeric substances (EPSs). Moreover, the algae inoculation reduced sludge diversity and shifted sludge community structure. Meantime, the stimulated bacteria selectively excite algal members that would benefit for the formation of algal-bacterial consortia. Consequently, the stimulated or inhibited of some species might be responsible for the performance of ASB-MBR.