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

Li Sun, Yu Tian, Jun Zhang, Lipin Li, Jian Zhang, Jianzheng Li

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1 **A novel membrane bioreactor inoculated with symbiotic sludge bacteria and algae:**

2 **Performance and microbial community analysis**

3 Li Sun ¹, Yu Tian ^{1,*}, Jun Zhang, Lipin Li ¹, Jian Zhang ¹, Jianzheng Li ¹

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5 ¹ State Key Laboratory of Urban Water Resource and Environment (SKLUWRE),

6 School of Environment, Harbin Institute of Technology, Harbin 150090, China

7 *Corresponding author. Tel: + (86) 451 8628 3077, Fax: + (86) 451 8628 3077, E-mail:

8 hit_tianyu@163.com

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10 **Abstract**

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

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