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Assessment of membrane fouling and biopolymers in a novel membrane bioreactor-microbial fuel cell hybrid system

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ABSTRACT

A lab-scale hybrid membrane bioreactor-microbial fuel cell system (hMBR) and a single MBR system (sMBR) were compared to investigate the characteristics of membrane fouling and biopolymers. The results indicated that both MBRs had excellent performance in the removal of chemical oxygen demand (COD) and ammonia nitrogen. Although the general compositions of the extracellular polymeric substances (EPS) and the soluble microbial products (SMP) were very similar, the concentrations in the hMBR were lower. An X-ray analysis indicated that Ca, Mg, Si and Fe were prone to accumulate on the membrane surface in the sMBR. An excitation-emission matrix (EEM) analysis showed that more aromatic proteins (I and II) and fewer humic/fulvic acid-like substances were observed in the hMBR. Moreover, almost half of the total components of EPS and SMP were soluble microbial metabolites in the hMBR. In conclusion, the hybrid system could alleviate membrane fouling by influencing the characteristics of the biopolymers.

Keywords: Membrane bioreactor; Microbial fuel cell; Extracellular polymeric substances; Soluble microbial products; Membrane fouling

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