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INTEGRATED MFC-MBR SYSTEM FOR WASTEWATER TREATMENT AND MEMBRANE FOULING MITIGATION

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A hollow-fiber membrane bioreactor (MBR) was integrated with a microbial fuel cell (MFC) to develop a novel system of MFC-MBR based on the utilization of electricity recovered by the MFC for wastewater treatment improvement and membrane fouling mitigation in the MBR. In this system, a maximum power density of 2.18W/m^3 and an average voltage output of 0.15V were achieved at an external resistance of 50 Ω. The removal efficiencies of COD, ammonia nitrogen (NH4+-N) and total nitrogen (TN) in the MFC-MBR were improved by 4.4%, 1.2% and 10.3%, respectively. It is worth noting that, in addition to reducing the deposition of sludge on the membrane surface by the electric field force, the MFC-MBR also alleviated the membrane fouling by sludge modification. Compared with the control MBR (C-MBR), less loosely bound extracellular polymeric substances (LB-EPS), lower SMPp/SMPc ratio, more homogenized sludge flocs and less filamentous bacteria were obtained in the MFC-MBR, which improved the dewaterability and filterability of the sludge. The cake layer on the membrane formed by the modified sludge was more porous with lower compressibility, significantly enhancing the membrane filterability. The MFC-MBR system was effective in membrane fouling mitigation with efficient wastewater treatment and energy recovery, demonstrating the feasibility of the minute electricity generated by the MFC for membrane fouling alleviation in the MBR.

Biography

Jun Zhang is the Associate Professor of Harbin Institute of Technology (HIT) in China. His research interest focus on biological wastewater treatment, membrane techniques for wastewater reuse. He has published above 50 SCI papers and 5 approved Chinese patents during the recent years. As the executive chairman, co-organize the 2015 IWA Water Reclamation and Reuse Conference. His research interests are biological wastewater treatment, sludge reduction, resource and energy recovery from sewage sludge based on membrane separation techniques.

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