# EuroSciCon &

### 7<sup>th</sup> Edition of International Conference and Exhibition on **Separation Techniques**

#### July 05-07, 2018 Berlin, Germany

Jun Zhang, Arch Chem Res 2018, Volume 2 DOI: 10.21767/2572-4657-C3-007

## A NOVEL INTEGRATED SYSTEM COMBINING MBR AND Worm-fixing bed for simultaneous sewage treatment, sludge reduction and membrane fouling mitigation



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embrane bioreactor (MBR) processes are among the Mmost economic and promising technologies for domestic and industrial wastewater treatment. Nevertheless, the ongoing requirements of excess sludge treatment/disposal and membrane fouling mitigation are major obstacles to the wide application of MBR. Using worm predation to reduce excess sludge is a potentially effective ecological technology of sludge reduction. Thus, a novel worm-fixing bed reactor with special porous carrier and combined aeration system was designed to investigate the sludge reduction induced by worms. Meanwhile, the introduction of worm-fixing bed to MBR could induce the changes of sludge properties which further alleviate the membrane fouling. Correspondingly, the integrated system (MBR-SSBWR) was composed of MBR and worm-fixing reactor achieving significant wastewater treatment efficiency, sludge reduction and membrane fouling mitigation simultaneously. The results showed that total sCOD and NH4+-N treatment efficiencies of 93.62 % and 96.2% were achieved in the integrated system. Regarding the sludge yields in conventional activated sludge (CAS) process, the sludge reduction percentages of 89% was observed in MBR-SSBWR system, in which an additional sludge reduction of 18.2 % was resulted from sludge predation. Soluble microbial products (SMP) and extracellular polymeric substances (EPS) were identified as the key membrane foulants for the membrane process. During the operation time of 100 days, the transmembrane pressure (TMP) in the combined system was maintained less than 5 kPa, while the final TMP in the Control MBR increased to 30 kPa. Due to the worm predation, the reduced amount of EPS was far more than the increased amount of SMP leading to a significant decrease of protein-like substances which were dominant in the membrane foulants.

#### 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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