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微电刺激环境下好氧颗粒污泥对有机负荷率的响应

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FESE 微电刺激环境下好氧颗粒污泥对有机负荷率的响应。 论文标题：Response of aerobic granular sludge to organic loading rate under micro-electric stimulation environment

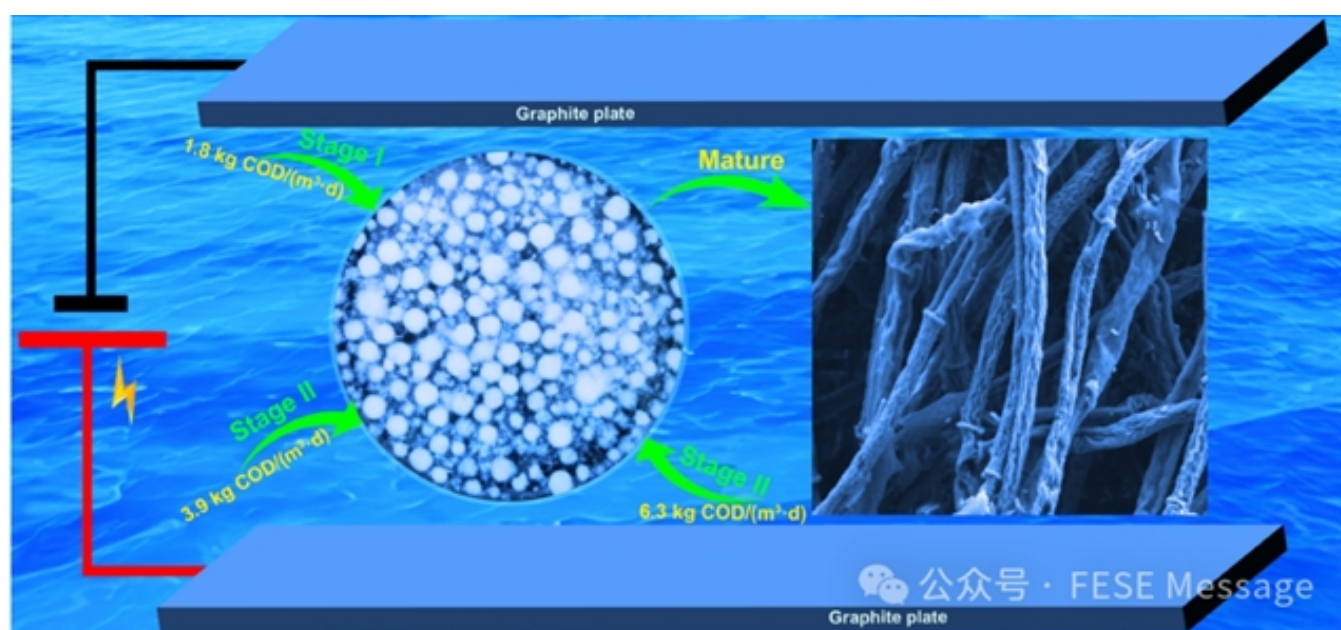
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摘要图

好氧颗粒污泥（AGS）是一种新型的废水处理技术，其形成过程受有机负荷率（OLR）的关键性调控。然而，OLR对AGS的独特作用机制尚未完全阐明，尤其是在复杂环境中。本研究探索了在微电刺激环境下OLR对AGS系统的影响。研究表明，动态的OLR影响着AGS的特性以及反应器的性能。在动态OLR环境下培养的AGS呈现出更紧密的结构，并且AGS系统在去除污染物方面表现出优异的能力。AGS的稳定结构与胞外聚合物（EPS）密切相关。胞外聚合物的主要成分包括色氨酸蛋白、酪氨酸蛋白、类腐殖酸物质和类富里酸物质。OLR变化的环境可能提供了一种选择性条件，从而影响微生物的种群。在OLR变化的AGS系统中，优势菌属为根瘤菌属（*Allorhizobium-Neorhizobium-Pararhizobium-Rhizobium*，相对丰度21.98%）、乳球菌属（*Lactococcus*，23.93%）和金黄杆菌属（*Chryseobacterium*，5.58%）。微生物种群的演变引发了功能基因的变化，例如碳水化合物代谢、DNA复制与修复以及膜转运功能等。本研究为解析OLR对AGS工艺的调控机理提供了新视角，有助于提升基于AGS的废水处理系统的运行稳定性。

RESEARCH ARTICLE

Response of aerobic granular sludge to organic loading rate under micro-electric stimulation environment

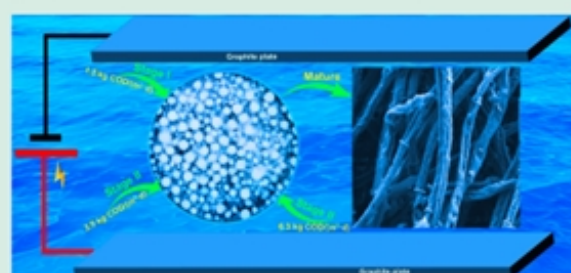
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HIGHLIGHTS

- The role of OLR on AGS under a complicated environment is rarely established.
- The dynamic OLR affected the behaviors of AGS and reactor performance.
- The variation of EPS content and constitutions was revealed.
- The main function microbes under the OLR-varied condition were identified.



ABSTRACT: Aerobic granular sludge (AGS) is a neoteric wastewater treatment technology. The organic loading rate (OLR) exhibits a critical effect on the AGS formation process. The special role of OLR on AGS is rarely established, especially in a complicated environment. This work explored the influence of OLR on the AGS system under a micro-electric stimulation environment. The dynamic OLR affected the behaviors of AGS and reactor performance. AGS cultured under a dynamic OLR environment showed a more compact structure and the AGS system displayed an excellent capacity in removing pollutants. The stable texture of AGS is related to the extracellular polymeric substance (EPS). The main constitutions of EPS include tryptophan protein, tyrosine protein, humic acid-like substance, and fulvic acid-like substance. The OLR-varied environment may provide a selective condition, impacting the microbial population. The prevail bacteria were *Allorhizobium-Neorhizobium-Pararhizobium-Rhizobium* (21.98%), *Lactococcus* (23.93%), and *Chryseobacterium* (5.58%) in OLR-varied AGS system. The evolution of the microbial population induced the change in bacterial community functions, such as carbohydrate metabolism, replication and repair, and membrane transport functions. This work provides valuable insights into the OLR on AGS processes, helping to the stability of AGS-based systems.

KEYWORDS: Biological treatment technology, Aerobic granular sludge, Organic loading rate, Microbial community structure, Metabolism function

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