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Rapid start-up of aerobic granular sludge bioreactor for the treatment of automobile coating wastewater performance and analysis of microbial community dynamics

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ABSTRACT

In this study, by inoculating 65% activated sludge and 35% intact aerobic granular sludge (AGS), the rapid granulation of AGS was achieved to treat automobile coating wastewater (ACW). The results showed that after 15 d of operation, compact AGS which a clear shape was found in the sequencing batch reactor with the sludge volume index is 31 mL/g, and an average particle size of 1.2 mm. When the reactor was operated for about 50 d, the chemical oxygen demand, total nitrogen, total phosphorus, and phenol could be effectively removed from the ACW by AGS, with removal rates of 85%, 82%, 62%, and 90%, respectively. Furthermore, the microbial community dynamics were studied by high-throughput sequencing. The correlation between the pollutant removal efficiency and the level of the microbial community (phylum, class, order, family, and genus) was investigated. The results showed that the most abundant genus *Thauera* played an important role in phenol degradation. Moreover, the abundances of *Zoogloea*, *Azoarcus*, *Stenotrophomonas*, *Sediminibacterium*, *Methyloversatilis*, and *Acidovorax* gradually increased. These functional genera had a significant effect on the biodegradation of phenol and organic matter. This research provides new insights into the rapid start-up of AGS bioreactors and illustrates the practical application potential of AGS technology in the treatment of phenol-containing ACW.

Keywords: Rapid granulation; Automobile coating wastewater; Aerobic granular sludge; Phenol; Sequencing batch reactor; High-throughput sequencing

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