地学前缘 2008, 15(6) 163-168 DOI: ISSN: 1005-2321 CN: 11-3370/P

论文

污水处理系统中活性污泥细菌多样性研究

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摘要:

采用分子生物学手段16S rDNA克隆文库方法对北京高碑店污水处理厂回流污泥中的细菌进行了多样性研究。结果表明,活性污泥系统中细菌群落具有高度多样性,所有克隆子分属5个不同的细菌类群,优势细菌类群为变形菌(proteobacteria),占克隆文库的76 7%;细菌类群优势依次为β 变形菌类群(β proteobacteria,占39 8%)、不可培养菌类群(uncultured bacteria,占22 33%)、γ 变形菌类群(γ proteobacteria,占20 15%)、α 变形菌类群(α proteobacteria,占6 79%)和δ 变形菌类群(δ proteobacteria,占4 85%);活性污泥中起硝化作用的主要是亚硝化单胞菌(Nitrosomonas sp.,占1 94%)和硝化螺旋菌(uncultured Nitrospirae bacterium,占11 65%),由于这2种硝化菌自身生长缓慢,难以与异养细菌竞争,以致其在文库中的比例较低;而作为反硝化细菌的陶厄氏菌属在文库中的比例却高达27 18%,可见该活性污泥具有较强的反硝化能力;克隆文库中还发现了少量的玫瑰单胞菌属(占4 85%),推测它的存在和有机磷的降解有关。

关键词: 活性污泥;微生物分子生态技术;16S rDNA克隆文库;细菌多样性;高碑店污水处理厂

Analysis on the bacterial diversity of active sludge in wastewater treatment plant

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Abstract:

A bacterial 16S rDNA gene clone library was constructed to investigate the bacterial diversity of active sludge in Gaobeidian Wastewater Treatment Plant, Beijing. The results indicated that, the bacterial diversity of active sludge was very high, and the clones could be divided into 5 different groups. The dominant bacterial community was proteobacteria, which accounted for 76.7%. The order of predominancy of bacterial communities are as follows: the β proteobacteria (39.8%), the uncultured bacteria (22.33%), the γ proteobacteria (20.15%), the α proteobacteria (6.79%) and the δ proteobacteria (4.85%). The Nitrosomonas like and Nitrospira like bacteria, such as Nitrosomonas sp. (1.94%) and uncultured Nitrospirae bacterium(11.65%) were also found, which have played important roles in oxidation of ammonia and nitrite in the system. However, they were only of a small amount because of their slow growth and less competitive advantage than heterotrophic bacteria. Denitrifying bacteria like Thauera sp. was at a high percentage, and it suggests that the active sludge has a stronge denitrifying effect. Roseomonas sp. was also found in the clone library, which could be related to the degradation of organophosphorus pesticide.

Keywords:

active sludge; microbial molecular ecology; 16S rDNA clone library; bacterial diversity; Gaobeidian Wastewater Treatment Plant

收稿日期 null 修回日期 null 网络版发布日期 null

DOI:

基金项目:

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国家重点基础研究发展计划“973”项目(G2007CB815600)；国家科技支撑项目(2006BAD25B04)
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