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菌株ZD8的分离鉴定及其异养硝化和缺氧/好氧反硝化特性研究

Isolation and identification of a bacterial strain ZD8 and its characteristics of heterotrophic nitrification and anoxic/oxic denitrification

关键词：缺氧/好氧反硝化 异养硝化 脱氮 去除速率 系统发育分析

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摘要：从稳定运行的ASBR厌氧氨氧化反应器中分离筛选出一株在缺氧和好氧条件下均具有高效反硝化能力的菌株ZD8,该菌株为假单胞属(*Pseudomonas* sp.),大小2 μm×0.25 μm,无鞭毛和芽孢.实验结果表明,缺氧条件下,ZD8最适合的碳源为柠檬酸钠;当C/N为10时,具有最佳的反硝化效果.菌株ZD8在缺氧条件下不具有硝化能力.在好氧条件下菌株ZD8获得最佳反硝化效果的C/N为22,最适合pH范围是7.2~9.9.菌株ZD8在好氧条件下具有高效的异养硝化能力,NH_4^+-N平均去除速率为8.3 mg·L^{-1}·h^{-1}.当以KNO_3为氮源时ZD8的反硝化速率为13.1 mg·L^{-1}·h^{-1};而以$NaNO_2$为氮源时,其反硝化速率为6.98 mg·L^{-1}·h^{-1}.在同时存在NH_4^+-N和NO_3^--N或NH_4^+-N和NO_2^--N的系统中,菌株ZD8均首先利用NH_4^+-N发生硝化作用,NH_4^+-N的存在对反硝化具有抑制作用,并且NH_4^+-N对NO_2^--N的反硝化抑制作用更强;在同时存在NO_3^--N和NO_2^--N的系统中,菌株ZD8优先利用NO_3^--N进行好氧反硝化脱氮.

Abstract: A bacterial strain named ZD8 was isolated and identified from an ASBR anaerobic ammonia oxidation reactor. Its size was 2 μm×0.25 μm without flagellum and spore. The experimental results showed that under anoxic condition, the optimal carbon resource for ZD8 was sodium citrate;when C/N was 10, the strain had optimal denitrification efficiency. Under anoxic condition, ZD8 did not have heterotrophic nitrifying ability. However, under oxic condition, the optimal denitrification efficiency appeared when C/N was 22 and the optimal pH range was 7.2~9.9. Under anoxic condition, strain ZD8 had good heterotrophic nitrification capacity, and the average removal rate of NH_4^+-N was 8.3 mg·L^{-1}·h^{-1}. When KNO_3 was utilized as nitrogen source, the average removal rate of NO_3^--N was 13.1 mg·L^{-1}·h^{-1}. When $NaNO_2$ was utilized as nitrogen source, its removal rate was 6.98 mg·L^{-1}·h^{-1}, In the mixed media of ammonium-nitrate or ammonium-nitrite, ZD8 was preferred to use ammonium to perform heterotrophic nitrification;the ammonium had inhibition on denitrification, and the inhibition to nitrite denitrification was more serious than nitrate denitrification. The strain preferred nitrate as the N source in the nitrate-nitrite mixed media.

Key words: anoxic/oxic denitrification heterotrophic nitrification nitrogen removal removal rate phylogenetic analysis

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