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Removal of nitrogen by heterotrophic nitrification-aerobic denitrification of a novel metal resistant bacterium *Cupriavidus* sp. S1

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Abstract:

A novel heterotrophic nitrifying and metal resistant bacterium was isolated and identified as *Cupriavidus* sp. S1. The utilization of ammonium, nitrate and nitrite as well as the production of N_2 proved the heterotrophic nitrification and aerobic denitrification ability of S1. The ammonium, nitrate and nitrite removal efficiencies were 99.68%, 98.03% and 99.81%, with removal rates of 10.43, 8.64 and 8.36 mg/L/h, respectively. A multiple regression equation well described the relationship between carbon source utilization, cell growth and nitrification. Keeping the shaking speed at 120 rpm was beneficial for denitrification. Moreover, different forms of nitrogen source could be utilize in simultaneous nitrification and denitrification. Additionally, the efficient removal of ammonium occurred at 20.0 mg/L Zn^{2+}, or 10.0 mg/L Ni^{2+} or 8.0 mg/L Cu^{2+} or 5.0 mg/L Cr^{6+}, 33.35 mmol/L sodium pyruvate, C/N 12–28. These findings demonstrate that S1 was effective for nitrogen removal in industrial wastewater containing heavy metal.

Keywords: