Separating and characterizing functional nitrogen degraders via magnetic-nanoparticle mediated isolation technology in high concentration of ammonia nitrogen wastewater treatment

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Magnetic-nanoparticle mediated isolation (MMI) is a new method for isolating active functional microbes from complex microorganisms without substrate labeling. In this study, the composition and properties of the magnetic nanoparticles (MNPs) were characterized by a number of techniques. And then the MNPs were added to activated sludge rich in ammonia nitrogen-degrading bacteria after long-term stable treatment, another set of experiments plus urea was set as the only carbon source in the system. Compared with the group without MNPs, degradation experiment results showed that the ammonia nitrogen degradation ability of a group of MNPs was slightly improved. The high-throughput sequencing results showed that the addition of MNPs did not change the microbial community structure of activated sludge under long-term stable conditions, and that the addition of urea as a nitrogen source significantly changed the microbial community structure. RDA analysis results also showed that Comamonadaceae_unclassified and Thiobacillus absolutely dominated in situ ammonia degradation, and the change in dominant genera showed the same trend as the degradation rate of ammonia nitrogen. It has also proved that the complex flora after adding magnetic nanoparticles is more adaptable to newly introduced pollutants, using MMI to study pollutant-degrading microorganisms under in-situ conditions has a broad application prospect.