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Review

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Impacts of silver nanoparticles on the nutrient removal and functional bacterial community in vertical subsurface flow constructed wetlands

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Abstract: The widespread utilization of silver nanoparticles (AgNPs) in industrial and commercial products inevitably raises the release into wastewater. In this study, the influences of AgNPs (0, 50 and 200 ug/L) on the performance and microbial community of CWs were evaluated. Compared with the control system (without AgNPs), the COD removal was not affected, whereas the TN, NH₄⁺-N, and TP removals were evidently affected in presence of AgNPs, and the effects had a positive relation with AgNPs concentration. In addition, AgNPs were effectively removed from wastewater and mainly accumulated in the soil layer and plant tissues. The illumina high-throughput sequencing results indicated that there were obvious variations in the microbial community at different AgNPs concentrations, associated with the variations of CW performance. Sequencing analyses also showed that *Proteobacteria*, *Acidobacteria*, *Bacteroidetes* were the dominant phyla. These results may provide valuable information and reference for evaluating the effect of AgNPs on constructed wetlands.

Keywords: Silver nanoparticles (AgNPs); Vertical flow constructed wetlands; Nutrient removal; Bacterial community structure

1. Introduction

With the rapid development of nanotechnology, engineered nanomaterials (ENM) are increasingly incorporated into commercial and industrial products (Maynard and Michelson, 2006). Due to its antimicrobial and antifungal properties (Li et al., 2008; Kim et al., 2007; Quardros and Marr, 2011), silver nanoparticles (AgNPs) are the one of the most commonly incorporated ENMs, which are used in a wide range of household

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