Mechanism and Effectiveness of Ti-based Nano-Electrode for Electrochemical Denitrification

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A novel Ti-based nano-electrode was fabricated to improve electrochemical nitrate reduction efficiency. The results of scanning electron microscopy (SEM) and X-ray photoelectron spectroscopy (XPS) demonstrated that the surface of the Ti-based nano-electrode was covered with a large number of nanoparticles, as well as relatively homogenous tubular structure, and that the main component of the electrode was TiO₂. Cyclic voltammetry (CV) analysis of Ti-based nano electrode result indicated that it was capable of enhanced electrochemical activity in comparison with Ti electrode. It was found that nitrate was removed efficiently by electrochemical means using the Ti-based nano-electrode as cathode with a Ti/Pt anode. The developed system was able to promote the electrochemical reduction of nitrate under a range of experimental conditions. The addition of NaCl was found to positively affect the removal of by-products, and thus, in combination with nitrate reduction, achieved the goal of clean, safe removal of pollutants.

Keywords: Ti-based nano-electrode, Nitrate, Reduction efficiency, Electrochemical approach

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