

## Fabrication and Characterization of Cu/Ti Bilayer Nanoelectrode for Electrochemical Denitrification

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A novel Cu/Ti bilayer nanoelectrode was fabricated to improve electrochemical nitrate removal rate. The Cu/Ti bilayer nanoelectrode was fabricated by plating Cu on Ti nanoelectrode. In the Cu/Ti bilayer nanoelectrode, Ti nanostructure of the electrodes surface can increase the specific surface area, meanwhile Cu presents high electrocatalytic activity for nitrate reduction. Using the Cu/Ti bilayer nanoelectrode, the nitrate concentration decreased from an initial concentration of 50.0 mg/L to 14.1 mg/L in the presence of 0.50 mg/L Na<sub>2</sub>SO<sub>4</sub> after 90 min electrolysis (nitrate removal efficiency of 71.8%). Under the current conditions, the removal efficiency of the Cu/Ti bilayer nanoelectrode was 254.6% compared with that of the Ti nanoelectrode for electrochemical denitrification. SEM images illustrated the Cu/Ti bilayer nanoelectrode is a honeycomb structure with sponge deposit on it. The XRD results showed the Cu/Ti bilayer nanoelectrode were dominated by Ti, Cu and O. For the same initial nitrate concentration, the nitrate removal rate increased sharply with increasing current density. In the presence of NaCl, especially with IrO<sub>2</sub> anode, a novel condition for performing both cathodic reduction of nitrate and anodic oxidation of the nitrite and ammonia by-products was achieved with high removal efficiency. Using the IrO<sub>2</sub> anode nitrate could be completely removed. In the treated solution, little amount of ammonia was detected

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**Keywords:** Nanoelectrode, Nitrate reduction, Electrochemical denitrification, removal rate, electrolytic reduction

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