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Strengthening the reactivity of $\text{Fe}^0/(\text{Fe}/\text{Cu})$ by premagnetization: implications for nitrate reduction rate and selectivity

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Abstract: In order to develop a better Fe^0 based system, premagnetization was used to enhance the reactivity of Fe^0 particles and Fe/Cu bimetallic particles micro-electrolysis ($\text{Fe}^0/(\text{Fe}/\text{Cu})$) system for nitrate wastewater treatment. In this study, the significant parameters (i.e., initial pH, premagnetization time and intensity of magnetic field) were optimized firstly. Under the optimal conditions, the premagnetization $\text{Fe}^0/(\text{Fe}/\text{Cu})$ system could obtain a high rate ($k_{\text{obs}}=0.732 \text{ min}^{-1}$) and better selectivity ([TN removal]/[NO_3^- -N removal] ratio=54.3%) for nitrate reduction, which were much superior to the 7 control experiments (i.e., $\text{Fe}^0/(\text{Fe}/\text{Cu})$ system, premagnetization Fe^0 particles and Cu^0 particles micro-electrolysis (premagnetization Fe^0/Cu^0) system, Fe^0/Cu^0 system, premagnetization Fe^0 system, Fe^0 system, premagnetization Fe/Cu system and Fe/Cu system). Meanwhile, it was confirmed that the prepared $\text{Fe}^0/(\text{Fe}/\text{Cu})$ could keep the high reactivity even after vacuum drying and longtime storage. Furthermore, the operational life of premagnetization $\text{Fe}^0/(\text{Fe}/\text{Cu})$ system is better than that of $\text{Fe}^0/(\text{Fe}/\text{Cu})$ system (for more than 12.6 L wastewater

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