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Reduction of Nitrite by Combined Ultrasound and Metallic Zinc Particles

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The chemical reduction of nitrite by combined ultrasound (US) and metallic zinc (Zn0) particles was studied under neutral pH conditions using MOBs as a buffer solution. Results have demonstrated that neither ultrasound nor metallic zinc alone was effective in reducing nitrite in water. However, their combined use provided a powerful denitrification effect by which more than %95 of nitrite was converted to ammonia or nitrogen gas within 30 min. The nitrite denitrification rate enhanced with increasing zinc powder dose and ultrasonic power, while increasing the initial nitrite concentration induced a negative effect. The surface morphology and elemental distribution of zinc particles were also investigated using Scanning Electron Microscope (SEM) and Energy Dispersive X-Ray Spectroscopy (EDX). SEM images have revealed that pits and cracks are formed on the surfaces of zinc particles by means of powerful ultrasonic shear forces. The EDX results indicated that ultrasonic treatment significantly lower the oxygen level on the particle surface that eventually paved the way for effective reduction of nitrite by metallic zinc under neutral pH conditions.

Keywords: Chemical reduction, nitrite, zero-valent zinc, ultrasound

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