Development of Water Purification System Using Magnetic Photocatalytic Particles

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Millions of people die each year due to infectious diseases stemming from sewage contamination and unsanitary conditions. Previous research developed magnetic iron oxide particles capable of degrading methylene blue; however, their effectiveness in treating actual sewage had not been evaluated. This study aims to develop magnetic photocatalytic iron oxide particles for water purification by utilizing sunlight to degrade contaminants and employing magnets to facilitate particle recovery and reuse. The photocatalytic properties of iron oxide particles synthesized via the solution combustion method are investigated, and their performance in real sewage treatment is assessed. To this end, 0.5 g of iron oxide particles were introduced into 50 mL of sewage collected from an irrigation canal and exposed to sunlight for intervals of 30 min, 1, 3, 5, and 7 d. The degradation of contaminants, including PO4³?-P, NH4?-N, NO2?-N, and NO3?-N, was analyzed using chromogenic reagents. The decrease in pigment concentration was quantified based on absorbance measurements obtained via spectrophotometry. The results indicate a substantial reduction in absorbance across most sewage components after one day of treatment. Following 7 d, all pollutants were effectively decomposed via photocatalytic reactions. Additionally, the synthesis of these particles is straightforward, requiring only sunlight and magnets, making them a promising material for water purification and environmental remediation.

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