Innovative Nanomaterials for Effective Water Quality Management in Sustainable Precision Agriculture

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Nanostructured materials have recently gained attention for their potential in detecting and removing environmental pollutants from irrigation water, particularly in precision agriculture. Known for their high surface area and customizable properties, these materials enable the development of advanced sensors that detect contamination with high sensitivity and accuracy, allowing real-time water quality monitoring. In addition to detection, nanomaterials are also crucial for removing harmful substances such as heavy metals, pesticides, and organic compounds, thus improving water quality and supporting plant health. [1] This purification process is vital for maintaining productivity and preventing the accumulation of harmful substances in the soil. By combining detection and removal capabilities, nanostructured materials offer a comprehensive solution, enhancing the effectiveness of purification and environmental monitoring, while ensuring sustainable management of water resources. Furthermore, the use of nanomaterials in these technologies promotes sustainable farming by utilizing secondary raw or bio-based materials, often sourced from agricultural waste. [2] This approach minimizes environmental impact, supports a circular economy, and provides a sustainable solution for water pollution in agriculture, helping farmers monitor water quality for healthier harvests and safer food.

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