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Analyzing the Evolution of Polythiophene Nanoparticles Optically, Structurally, and Morphologically as a Sers (Surface-Enhanced Raman Spectroscopy) Sensor Pb^{2+} Detection in River Water

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Abstract : This study investigates the evolution of polythiophene nanoparticles (PThNPs) as surface-enhanced Raman spectroscopy (SERS) sensors for Pb^{2+} detection in river water. We analyze the PThNPs' optical, structural, and morphological properties at different stages of their development to understand their SERS performance. Techniques like UV-Vis spectroscopy, Fourier-transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), and scanning electron microscopy (SEM) are employed for characterization. The SERS sensitivity towards Pb^{2+} is evaluated by monitoring the peak intensity of a specific Raman band upon increasing metal ion concentration. The study aims to elucidate the relationship between the PThNPs' characteristics and their SERS efficiency for Pb^{2+} detection, paving the way for optimizing their design and fabrication for improved sensing performance in real-world environmental monitoring applications.

Keywords : polythiophene, Pb2+, SERS, nanoparticles
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