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Photocatalytic applications of Nickel pyrophosphate nano-particles in wastewater treatment

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Abstract

Nickel pyrophosphate ($\text{Ni}_2\text{P}_2\text{O}_7$) is an interesting material with use in energy storage devices and super-capacitors. The surfactant-mediated approach is used to synthesize nickel pyrophosphate nano-particles and further analyze using Powder XRD and TEM for confirmation of nano-structured nature. Methylthioninium chloride or popularly known methylene blue (MB) organic dye is chosen for the photo-catalytic study using nickel pyrophosphate nano-particles. Due to large industrial use, the MB is found in wastewater and hence, the decomposition of MB has become a degradation standard practice. The photo-degradation of MB by nickel pyrophosphate nano-particles is confirmed through several analyses, viz., wastewater analysis, total organic carbon

(TOC) analysis, ion chromatography, and UV–Vis. The results indicate that MB degrades in lower-molecular weight leuco dye. This gives an important application of synthesized nickel pyrophosphate nano-particles in an organic pollutant removal. To evaluate the electrochemical properties of nickel pyrophosphate nano-particles, the electrochemical impedance (EIS) spectral analysis is reported. Nickel pyrophosphate nano-particles are found to be potential photo-catalysts for MB dye degradation.

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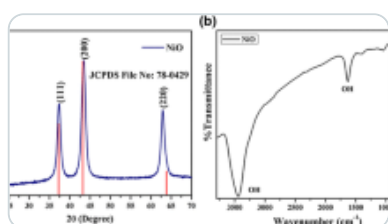
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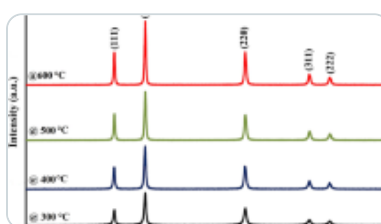
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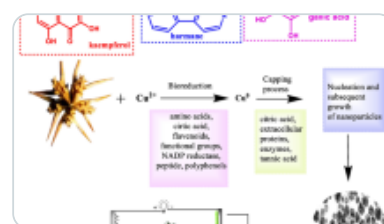
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Data availability

The authors do not have permission to share data.

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Contributions

All authors contributed to the study conception and design. Material preparation, data collection, and analysis were performed by Mahatta Oza and P. D. Solanki. The first draft of the manuscript was written by Mahatta Oza and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Ethics declarations

Conflict of interest

This work is not published in any other journal or book. But this work is the part of one of the author's (PDS) thesis (Synthesis and characterization of some pure and doped pyrophosphate nano-particles) submitted to Saurashtra University in June 2020.

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