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The Kinetics of a Palladium Precursor – Tobacco Mosaic Virus Reaction

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Abstract

There have been numerous developments in the field of production of metallic nanoparticles using biotemplates such as the Tobacco Mosaic Virus (TMV). Past research has looked at the conditions required to maximise nanoparticle formation. This study of the kinetics of a nanomaterial synthesis reaction using a biotemplate would elucidate the understanding of the controlled growth of nanoparticles, which can be applied in the fabrication of photocatalysts, electrical nanocircuits and solar cells. This study specifically focuses on the reaction between a palladium precursor and the TMV without an external reducing agent, where the palladium ion concentration is measured over time using UV-Visible, Atomic Absorption and X-Ray Absorption Spectroscopy methods. The results from these experiments allow us to compare the trends and variations of the palladium ion concentration over time. We found that the results using UV-Visible Spectroscopy did not verify those using X-Ray Absorption methods which signals that there are likely to be flaws in the UV-Visible methods that need further analysis in order to be resolved. Atomic Absorption was used to gauge the impact of external particles in the reaction solution on absorbance; however the faulty hollow cathode lamp on the spectrophotometer limited its effectiveness. These findings are significant in that they are a step into the study of the effectiveness of different spectroscopy methods to measure concentration. This would pave the way for obtaining more information about the general kinetics of reactions between metals and viruses, and thus allow us to fabricate nanoparticles in a controlled manner.

Keywords

Nanoparticles, Reaction Dynamics, Tobacco Mosaic Virus, Metallic particles, UV Visible Spectrometry, Atomic Absorption Spectrometry, X-Ray Absorption Spectrometry,

References

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