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# Adsorption mechanisms of palladium on the Tobacco Mosaic Virus surface

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## ABSTRACT

Organic-inorganic materials synthesis using biological templates has recently drawn immense attention of researchers. Biotemplating has shown to be an efficient and economic means of nanomaterials production. Naturally stable, readily available and genetically malleable, Tobacco Mosaic Virus (TMV) is one of the most extensively studied and characterized biotemplates. Particularly, templated synthesis using TMV has produced high quality nanorods and nanowires that have been applied to batteries, memory devices and catalysis. The fundamental mechanisms, governing the adsorption of palladium on the TMV Wild Type and genetically modified versions (TMV1Cys and TMV2Cys), are not fully understood; this knowledge, however, is essential for future controllable synthesis. We are using UV Vis spectrometer to track the absorbance of palladium species in the solution in order to model the mechanism of adsorption on TMV surfaces using Freundlich and Langmuir isotherms. The mechanism is studied at 25 degrees Celsius at various palladium incubation concentrations. Adsorption on TMV Wild Type and TMV1Cys was successfully characterized by Langmuir isotherm, while adsorption on TMV2Cys, however, was found to be well characterized by Freundlich isotherm. With these models we were able to quantify the maximum capacities and adsorption intensities for TMV Wild Type and its mutants. Therefore, we were able to mathematically describe the differences in adsorption caused by the presence of thiol groups on the surface of TMV.

## KEYWORDS

Tobacco Mosaic Virus, palladium adsorption mechanism, adsorption capacity, adsorption intensity, Langmuir Isotherm, Freundlich Isotherm