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Colorimetric detection of malathion residues in water using melamine functionalized silver nanoparticlesNaveen Kumar¹, Harish Kumar¹, Prince Chawla² and Ravinder Kaushik²¹Amity University Rajasthan, India²Shoolini University, India

Pesticides are being used in such a huge amount to control the pests in agriculture, industries and human premises that their residues are en-routing in the food chain. These pesticide residues are responsible for causing health implications such as skin and eye irritation, cancer, allergy, asthma, nervous breakdown etc. So, it has become necessary to develop the simple and fast methodologies for the on-site monitoring of pesticides residues in different matrices. Traditional analytical techniques such as GCMS and LCMS are sensitive and reliable but time consuming, sophisticated and expensive. Therefore, we have developed silver nanoparticles based colorimetric method for easy and fast detection of malathion residues in the drinking water. Silver nanoparticles (size 13nm) were synthesized by chemical reduction method and functionalized with melamine to render net positive charge on the surface.

Size of nanoparticles increased with functionalization but aggregation was prevented by using calculated concentration of melamine. These melamine functionalized silver nanoparticles were then used for developing the colorimetric method for the detection of malathion residues. Malathion which is having multiple negative charges reacts with the silver nanoparticles coated with melamine and causes the aggregation of nanoparticles. This reaction resulted in the color change of solution and corresponding change in the UV-Vis spectra (λ_{max} shifted from 340nm to 590nm); zeta potential; and TEM images. The developed colorimetric method is very simple but highly sensitive as color change can be visualized with naked eyes without use of any sophisticated instrumentation.

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