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Functionalized gold nanoparticles based colorimetric sensors for heavy metal ions from waste water

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Contamination of water by heavy or toxic metal ions can lead to serious environmental and human health problems. There are several toxic metal ions (e.g., mercury, cadmium and lead) can cause serious environmental and human health problems because of their acute and chronic toxicity to biological system. For example, the most common form of mercury in water is mercuric ion (Hg^{2+}) which is widely released to the environment from industrial source, shows high toxicity mainly on renal and nervous systems through the disruption of enzyme activity. On the other hand, lead ions (Pb^{2+}) released to the environment through dyes, gasoline and batteries and it can cause neurological, cardiovascular and developmental disorders in especially children. Another highly toxic metal ion is cadmium (Cd^{2+}), found in many end user products such as plastics, batteries, cigarettes and dyes. Therefore, monitoring of toxic metal ions in water (drinking, sea, lake, etc.) is very essential in terms of improving human health and water quality. There are several methods used for heavy or toxic metal ion detection which is often based on chromatographic and spectroscopic techniques such as inductively coupled plasma mass spectrometry (ICP-MS), atomic absorption spectrometry (AAS), high performance liquid chromatography (HPLC) and electrochemistry. Although these methods are highly sensitive and selective, they require high sophisticated instruments, are expensive, time-consuming and non-portable. Therefore, low cost, simple, rapid, portable and green methods for metal ion detection are still highly desired. In this regard, colorimetric methods based on functionalized gold nanoparticles (AuNPs) are convenient and attractive, and can satisfactorily meet these demands. Because AuNPs exhibit high extinction coefficients, strongly distance-dependent optical properties, and colors arising from AuNPs at nanomolar concentrations allow them to be easily monitored by the naked eye without the aid of any advanced instruments.

Biography

Palash Mondal has completed his PhD from Visva-Bharati University, Santiniketan, India, in 2013. During his PhD study, he focused research on polymer encapsulated nanomaterials for extraction of toxic metal ions from aqueous solution. Currently he is a Post-doctoral Research Scholar at Arizona State University, Arizona, USA. Presently he is working on polymer capped functionalized gold nanoparticles for detection of heavy or toxic metal ions from waste water.

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