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Abstract

Spectrofluorometric assay using gold nanoparticles and cationic dye Rhodamine B for selective and sensitive detection of L-Cysteine in aqueous environment

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Abstract:

L-Cysteine (abbreviated as L-Cys) is an important thiol containing amino acid which is found in human plasma and is known as the primary building block of protein. This amino acid is involved in many essential and important biological processes in our physiological system. Although the presence of L-Cys in our body has number of health benefits, but excess amounts of this amino acid in human plasma or urine causes several health problems such as neurotxicity1, urinary stones2 etc. So, it is of prime importance to detect L-Cys selectively and more accurately in order to prevent our body from various diseases. In this present study we address a mechanism for selective and sensitive sensing platform utilizing the interaction of colloidal gold nanoparticles and cationic dye Rhodamine B (RhB) towards the detection of L-Cys from the fluorometric change of the dye molecules in an aqueous environment. Initially the presence of Au NPs causes the drastic reduction of fluorescence signal of RhB molecules in their mixed solution due to some non-radiative energy transfer process. But the addition of L-Cys solution to Au/RhB mixed solution recovers the fluorescence signal and is found to be linear within the concentration range of 0.01 µL – 1000 µL of L-Cys. The experimental limit of detection (LOD) was 0.01 µL and may be comparable to that present in human blood plasma. Also the recovery of fluorescence of RhB due to the selective interaction of L-Cys with Au NPs is accompanied with a colour change from wine to bluish black. The interference of all other amino acids including some thiol (-SH) containing amino acids along with some neurotransmitters (Na^+, K^+ etc.) present in our body have been tested in the same aqueous environment. The proposed mechanism for sensing of L-Cys is also tested with human urine sample to confirm its applicability to the real biological sample in vitro. UV-vis absorption and Transmission electron microscopy have been employed to characterize the as synthesized Au NPs. Our proposed fluorometric assay method for L-Cys detection may have great potential for biomedical applications with high degree of accuracy.

Biography:

Dr. Pabitra Kumar Paul has completed his PhD in Physics from Tripura University, India in 2011 and presently working as an Associate Professor at Jadavpur University in India. He did Postdoctoral Studies from Department of Chemistry of the University of Texas at El Paso, USA and Osaka University, Japan. He has published more than 25 papers in reputed international journals and also reviewers of many reputed research journals. He has active collaboration with many research groups in India and abroad.

Publication of speakers:

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3. 13th International conference on Smart Material and Polymer technology; February 19-20 2020, Paris, France.

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