

Positively Charged Gold Quantum Dots: An Nanozymatic “Off-On” Sensor for Thiocyanate Detection

K. M. Yacob

Marma Health Centre Kochi, Kerala, India

yacobm@gmail.com

Abstract

The concentration of thiocyanate (SCN^-) in bodily fluids is a good indicator of potential and severe health issues such as nasal bleeding, goiters, vertigo, unconsciousness, several inflammatory diseases, and cystic fibrosis. Herein, a visual SCN^- sensing method has been developed using the enzyme-like nature of positively charged gold quantum dots (Au QDs) mixed with tetramethylbenzidine (TMB) and hydrogen peroxide (H_2O_2). This research also reports a new method of synthesizing positively charged Au QDs directly from gold nanoparticles through a hydrothermal process. Microscopic imaging has showed that the Au QDs were 3–5 nm in size, and the emission wavelength was at 438 nm. Au QDs did not display any enzyme-like nature while mixed up with TMB and H_2O_2 . However, the nanozymatic activity of Au QDs appeared when SCN^- was included, leading to a very low detection limit (LOD) of 8 nM and 99–105% recovery in complex media. The steady-state kinetic reaction of Au QDs showed that Au QDs had a lower Michaelis–Menten constant (K_m) toward H_2O_2 and TMB, which indicates that the Au QDs had a higher affinity for H_2O_2 and TMB than horseradish peroxidase (HRP).

Received: April 15, 2022; **Accepted:** April 20, 2022; **Published:** April 28, 2022

Biography

A practicing physician in the field of healthcare in the state of Kerala in India for the last 30 years and very much interested in basic research. My interest is spread across the fever, inflammation and back

pain. I am a writer. I already printed and published nine books in these subjects. I wrote hundreds of articles in various magazines.