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Graphene-based signal-enhanced in vitro diagnostic kits for healthcare applications

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Graphene has been widely used in biosensor and bioanalytical applications due to its high electrical and thermal conductivity, large surface area, high mechanical strength, low cost and absence of metallic impurities. During the last decade, graphene has been extensively employed for electrochemical sensing of blood glucose and other analytes. But the recent years have seen its use in diverse bioanalytical applications. We have used graphene in the development of signal-enhanced in vitro diagnostic (IVD) kits for various disease biomarkers such as human lipocalin 2, human fetuin A and C-reactive protein. The developed IVD kits have many-fold higher analytical sensitivity, significantly reduced immunoassay duration, and highly improved analytical performance in comparison to the commercial IVD kits. They employ a highly simplified and cost-effective bioanalytical procedure involving our proprietary one-step antibody immobilization procedure and one-step kinetics-based immunoassay. They have high analytical precision, as demonstrated by correlation with commercial IVD kits, and can detect biomarkers in complex sample matrices, such as human whole blood, plasma and serum. Moreover, the antibody-bound graphene-functionalized microtiter plates have high storage stability, as desired for the clinical settings. Therefore, they can be reliably employed for the highly-sensitive and rapid detection of disease biomarkers in clinical diagnosis.

Biography

Sandeep K Vashist completed his PhD from Central Scientific Instruments Organisation, India in 2006. He was Scientist at Bristol-Myers Squibb Company, Ireland (2006-2009), Team Leader at NUS Nanoscience and Nanotechnology Initiative, Singapore (2009-2012) and presently, the Head of Immunodiagnostics at HSG-IMIT, Germany. His outputs include many technology transfers, 5 PCT stage patents, 60 publications in reputed journals, and 70 publications in international conferences. He has received prestigious fellowships and awards from renowned institutions for scientific excellence. He is Executive Editor of J *Basic Appl Sci* and *J Pharma Bioanal Sci*; Editorial Board Member of *J Nanomed Nanotechol* and *J Nanomat Mol Nanotechnol,* and expert reviewer for many journals and funding agencies.

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Visible light induced photocatalysis using zinc based spinel hetaerolite nanoparticles

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Spinel $ZnMn_2O_4$ nanoparticles were prepared by low temperature hydrothermal procedure and structurally characterized by X-ray powder diffraction (XRD), field emission scanning electron microscopy (FESEM), X-ray photoelectron spectroscopy (XPS), Fourier transform infrared (FTIR) and UV-visible spectroscopy which illustrate that the synthesized material is optical active and composed of well crystalline body-centered tetragonal nanoparticles with average size of ~38 ±10 nm. Hetaerolite nanoparticles were applied for the degradation of organic pollutant which executed high solar photo-catalytic degradation when applied to brilliant cresyl blue under visible light.

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