

# E-BABE- Graphene Hybrids Polymer Composite Nanomaterials Based on Electrochemical DNA Sensors

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## Abstract

Electrochemical genosensors for the ultra-trace determination of label-free DNA hybridization with ultrahigh sensitivity, low cost, specific selectivity and fast analysis can be developed for cancer diagnosis and food science in complicated samples using a variety of gold (Au) nanomaterials and their three-dimensional (3D) nanoarchitectures as well as layer-by-layer (LBL) assembly. We explored the LBL assembled gold nanoparticles (AuNPs)/lower-generation ( $G_n \leq 3$ ) polyamidoamine dendrimer (PD) with the reduced graphene oxide (rGO) core as electrochemical gene nanobiosensing platforms with 3D fractal nanoarchitecture for fast, ultra-trace determination of label-free DNA hybridization. Their morphologies, structures, electrochemical properties, and gene nanobiosensing performances were characterized. AuNPs/GG2PD displayed the best excellent structural stability, lowest mobility on solid surface with the increasing charge resistance, widest linear range ( $1.1 \times 10^{-6} - 1 \times 10^{-18}$ ), and the lowest limit of detection ( $1.87 \times 10^{-19}$  M) in comparison with both AuNPs/GG1PD-based and AuNPs/GG3PD-based probes. This work will provide a new candidate for the development of metal nanoparticles functionalized PD with inorganic nonmetallic nanomaterials as cores with 3D fractal nanoarchitecture and promising electrochemical gene nanobiosensing platforms based on dendrimer-nanoinorganic hybrids with 3D nanoarchitectures and LBL assembly for fast and ultra-trace detection of label-free DNA hybridization with potential application in bioanalysis and medical diagnosis of genetic diseases.

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## Biography

Kumarasamy Jayakumar works in Biosensors & Nanoengineering Lab, Institute of Agricultural Engineering, Agricultural Research Organization, Rishon LeZion, 505101, Israel. Moreover, He had completed his M.Sc. degree at Annamalai University, India in 2007. During, M.Phil., Chemistry from Madurai Kamaraj University, Madurai, Tamil Nadu, India in 2008 and a Ph.D. degree from the Alagappa University, Karaikudi, Tamil Nadu, India in 2015. He received his post-doctoral researcher position at Pusan National University, Busan in

South Korea between March 2015 to August 2015 followed by Post-doctoral appointments from Department of Chemistry, Nanjing University, Nanjing, China (2017 to 2019). He also reviewed high repeated national and international journals and participated in oral presentations for national and international conferences in India, Europe, and China. Currently, He has contributed to published more than eight research articles for high repeated and international journals over the last five years. Although, the electrochemical DNA biosensing articles reached 150 citations and h-index 8 and one book chapter.