

## Graphene core low generation PAMAM dendrimers and gold nano particle composites for the label free electrochemical DNA sensors

V. Dharuman, R. Rajesh, K. Jayakumar, R. Venkatesan and J.H. Hahn

<sup>a</sup>Department of Bioelectronics and Biosensors, Alagappa University, India

<sup>b</sup>Department of Chemistry, Pondicherry University, India

<sup>c</sup>Laboratory for Advanced Biotechnology and Biomedical micro Instrumentation, Biotech Centre, Department of Chemistry, Pohang University of Science and Technology, Hyoja Dong, South Korea

We developed new composites of graphene core based dendrimers of first, second and third generations PAMAM dendrimers and used as platforms for anchoring DNA molecules for affinity biosensors development. In contrast to the conventional DNA immobilization via covalent coupling using expensive reagents and time consuming protocol, we simply decorated the layers with Au nano particles (~17nm) for the covalent attachment of thiol capped DNA. The layers were used for the label free electrochemical DNA hybridization sensing. The discrimination of the hybridized (completely complementary target hybridized) and un-hybridized (completely non-complementary target hybridized surfaces) surfaces on these three different dendrimers shows increased discrimination efficiency with dendrimer generation. The sensors were characterized by Ultra Violet (UV), Fourier Transform Infrared (FTIR), Surface Enhanced Raman spectroscopy (SERS), Thermo gravimetric analysis (TGA), Scanning Electron Microscopy (SEM), Atomic Force Microscopy (AFM), Cyclic Voltmetric (CV), Impedance spectroscopy (IS) and Differential Pulse Voltammetry (DPV) techniques. The difference in discrimination efficiencies are correlated with the change of planar to the globular structure of the graphene core dendrimers with increasing generation, resistance and diffusion restriction nature of the layers.