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Notice for the PhD Viva Voce Examination

Ms Jemini Jose (Reg. No. 1740081), PhD scholar at CHRIST (Deemed to be University), will defend her PhD thesis at the public viva-voce examination on Saturday, 20 March 2021 at 10.00 am on the Webex Meeting platform.

Title of the Thesis	:	**Anchored Organic and Inorganic Compounds on Graphene Framework as Materials for Sensing and Energy Applications**
Discipline	:	**Chemistry**
External Examiner (Outside Karnataka)	:	**Dr M R Prathapachandra Kurup** Professor & Dean Department of Chemistry School of Physical Science Central University of Kerala NH 17, Periya, Kasaragod Kerala - 671316
External Examiner (Within Karnataka)	:	**Dr Aruna S T** Senior Principal Scientist Surface Engineering Division CSIR-National Aerospace Laboratories Bangalore - 560017 Karnataka
Supervisor	:	**Dr Sreeja P B** Associate Professor Department of Chemistry School of Sciences CHRIST (Deemed to be University) Bangalore Central Campus Bengaluru - 560029 Karnataka

The members of the Research Advisory Committee of the Scholar, the faculty members of the Department and the School, interested experts and research scholars of all the branches of research are cordially invited to attend this open viva.

Registrar

Place: Bengaluru
Date: 16 March 2021

ABSTRACT

The specific atoms or group of atoms that can attach to the other organic or inorganic compounds due to the strong affinity is called as the anchoring group. The electrons from these organic and inorganic compounds are potent to travel through the anchor group. This leads to specific features with the change in the arrangement of atoms in the entire molecule/system. Hence, the redox reaction properties, molecular chain length and the extent of conjugation of the resultant anchored product vary. Depending upon the binding nature, anchoring groups can be divided into monodentate, bidentate, and multidentate. Among these, multidentate anchoring groups are more significant since it can bind either partially to the molecules or with the whole surface. Though many multidentate anchoring groups like fullerene, carbon nanotubes, polymers, calixarenes, and graphene are presented in the literature, graphene oxide anchored organic and inorganic compounds are important because of its amazing contributions to the material science and design. The high thermal and electrical conductivity, large surface area, mechanical strength, and availability of more mobile electrons make graphene as the suitable anchor group for diverse applications in the field of adsorption of polluted gases, catalyst for the organic conversions, medicinal chemistry, electrochemical sensing, and energy storage devices. Therefore, Graphene oxide (GO) is one of the good choices to develop supercapacitance systems and electrochemical sensing materials. Heteroatom doping, conducting polymer, metal complexes, and metal oxides anchored graphene oxide are more significant because they change the electroactive properties significantly. Considering these, we studied the photophysical and electrochemical properties of chromium complex anchored GO that are synthesised by silane and diazonium coupling. The results exhibited that both silane functionalized GO and azo dye enable an electronic interaction due to the recombination of sp2 and sp3 states and electron-hole pairs which have extensive importance in developing optoelectronic devices.

The chromium complex anchored rGO showed potential electrochemical sensing properties towards the detection of paracetamol. We synthesised and developed two novel nitrogen functionalized GO using nicotinic acid hydrazide (NAHGO) and benzoic acid hydrazide (BHGO) for electrochemical sensing of caffeine and supercapacitor applications. Besides, polypyrrole/palladium oxide and zirconium oxide/multiwalled carbon nanotube anchored on GO for enhanced supercapacitor performances. We used a simple chemical reduction method for nitrogen functionalization, urea based synthesis for ZrO2 composites, and electrodeposition approach for PdO composites. All the synthesised compounds are characterised for their crystalline structure (Powder X-ray diffraction (PXRD)), chemical bonding (Fourier transform infrared spectroscopy (FTIR) and Raman spectroscopy), elemental composition and distribution/mapping (Energy dispersive X-ray spectroscopy (EDX), composition and chemical states (X-ray photoelectron spectroscopy (XPS)), and morphology (Transmission electron microscopy (TEM) and Scanning electron microscopy (SEM)). These results of anchored organic and inorganic compounds demonstrate the excellent structure-property relationship facilitate the interaction between the anchoring and the anchored group that paves the way for electrochemical sensing and energy storage devices.

Keywords: anchoring and anchored group, electrochemical sensor, graphene oxide, caffeine, supercapacitor