ABSTRACT

This research study provides the detailed discussion about the graphene-based nanocomposites such as GO/Ag and GO/ZnO nanocomposites that have brought noteworthy consideration due to its versatile bioapplications along with amazing physical and chemical properties. Graphene oxide is an effective platform on which Ag and ZnO nanoparticles give rise to the GO/Ag and GO/ZnO nanocomposites. In this experimental work, the toxicity of graphene oxide/silver (GO/Ag) and GO/ZnO nanocomposites were examined in an in vitro breast cancer model by optimizing the morphology of cancerous cells, reactive oxygen species and singlet oxygen while Photo dynamic therapy (PDT) parameters were seen using GO-Ag as well. Both GO/Ag and GO/ZnO composites were fabricated by hydrothermal method, and characterized by transmission Electron Microscopy (TEM), X-ray diffraction (XRD), Field Emission Scanning Electron Microscope (FE-SEM), Energy Dispersive Spectroscopy (EDS), UV-visible spectroscopy and Atomic Force Microscope (AFM). These experiments were performed both in darkness and in the presence of exposure of laser, to examine the phototoxic and cytotoxic effects of GO/Ag composites on MCF-7 cell lines. Using generation of intracellular (Reactive Oxygen Species (ROS) and methyl thiazole tetrazolium (MTT) assay, toxicity of the GO/Ag and GO/ZnO nanocomposites was confirmed. The toxic effects of nanocomposites investigated the dose dependent reduction in the viability of cells and by apoptosis significant cellular death. An extremely noteworthy liberation of singlet oxygen and experimental outcomes were also confirmed by statistical analysis student t-test, with p-values < 0.05 observed as significant. These consequences suggest that the GO/Ag and GO/ZnO nanocomposites must serve as best candidates for the treatment of cancer cells. The tiny size energy storage devices are highly demanded in the field of electronics. In this perspective due to fast charging discharging rate and very high power and energy density, the supercapacitors exhibit the great potentials. Graphene based nanocomposites have versatile properties for example excellent electrical conductivity and large surface area. The conducting polymer polyaniline (PANI) shows high specific capacitance. But one drawback of PANI is that its stability is decreased due to swelling and shrinkage during charging/discharging cycle in the electrolyte that

contains the aqueous solution of 1M H_2SO_4 solution, this difficulty can be removed by synthesis of polyaniline doped graphene based nanocomposites. In our research study, we fabricated polyaniline doped rGO-$NiPbTiO_3$ nanocomposites to make the pseudocapacitors electrode. The charge-discharge curve is used to measure its specific capacitance which was found to be 1180 F/g. The shape of the CV curve showed that the faradic reaction took place due its pseudocapacitive behavior and the stability of device was 89% after 10,000 charging discharging cycles. These nanocomposites also had considerable power and energy density when compared to previous literature. This study summarizes the present efforts in the fabrication of graphene-based composites with anticancer, photodynamic activities. Moreover, fabrication of polyaniline doped rGO-$NiPbTiO_3$ clarifies as new tools to tackle the current challenges in fighting against energy crises.