**Abstract**

Technology research in nanotechnology promises breakthroughs in areas such as materials and manufacturing nanoelectronics, medicine, healthcare, energy, biotechnology, information technology, and national security. One of the crucial bottlenecks for the application of graphene-based systems in materials science is their mass production. Meeting the requirements, graphene oxide (GO) has been considered widely as a prominent precursor and a starting material for the synthesis of this processable material [1]. This work describes the synthesis and characteristic analysis of Graphene oxide (GO) and reduced graphene oxide. Graphene Oxide (GO) is synthesized in large quantity from Natural Flake Graphite (NFG) by modified Hummer’s method. The synthesized GO is chemically reduced to Reduced Graphene Oxide (RGO) using hydrazine monohydrate as reducing agent via wet chemical method. The synthesized samples are characterized using Fourier Transform Infrared (FTIR) spectroscopy, X-ray Diffraction analysis (XRD), Scanning Electron Microscopy (SEM) with Energy Dispersive X-Ray (EDS). The characterized samples have been tested for the removal of dye from water in water purification process.