LIST OF FIGURES

Figure No.	Title	Page No.
2.1	Schematic mechanism of semiconductor photocatalysis for organic dye degradation	8
2.2	Flow chart of various preparation route of graphene nanosheets.	13
2.3	Chemical structure of a) Graphene and b) Graphdiyne	14
3.1	(a) X-ray differaction pattern (b) scanning electron microscope (c) transmisson electon microscopy and (d) energy dispersive electron spectrscopy of GO	24
3.2	Fourier transform infrared spectra of various oxidized GO	25
3.3	XPS spectra of GO samples with different degree of oxidation levels	26
3.4	Raman spectra of (a) graphite (b) GO samples (c) plot of I_D/I_G ratio verses different degree of oxidation levels	29
3.5	Photoluminescence Gaussian fitting spectra of different degree of oxidation levels (a) G1, (b) G2 (c) G3 and (d) G4	30
3.6	(a) Digital photographic image of GD coated copper foil (b) SEM image of bare copper foil (c) SEM image of GD coated copper foil and (d) EDAX spectra of GD coated copper foil	32
3.7	(a) FT-IR spectra and (b) Raman spectra of graphdiyne nanostructure	33
3.8	(a) XPS survey spectra and (b) deconvoluted spectra of graphdiyne nanostructure	34

4.1	(a) The plot of removal efficiency (G4) against different MB concentrations (b) MB removal efficiency of GO samples of various oxidation levels (c) Digital photographic image of dye water treated with different degrees of oxygenated GO and (d) Zeta potential of different degrees of oxygenated GO	38
4.2	Effect of pH (5-10) on adsorption of MB by GO with different degrees of oxidation levels	40
4.3	Effect of temperature on adsorption of MB by GO with different degrees of oxidation levels	42
4.4	Van't Hoff plot on adsorption of MB by GO samples with different oxidation levels (a) G1 (b) G2 (c) G3 and G4 (d)	44
4.5	Langmuir adsorption isotherms of MB in different oxidation levels of GO	45
4.6	Freundlich adsorption isotherms of MB in different oxidation levels of GO	47
5.1	X-ray diffraction of GO and GO-Fe^{3+} hybrid	50
5.2	(a) UV–vis and (b) enlarged PL spectrum of GO and GO-Fe^{3+} hybrid	51
5.3	X-Ray photoelectron spectra of GO and GO-Fe^{3+} hybrid (a) C1s deconvoluted spectra of GO (b) and GO-Fe^{3+} hybrid (c)	52
5.4	Raman spectroscopy of GO and GO-Fe^{3+} hybrid	54
5.5	Sonocatalytic degradation of RR120 dye and their time dependent UV in the presence of (a) GO (b) Fe^{3+} and (c) [GO-Fe^{3+}] = 6 mg L^{-1}. (d) Pseudo first order rate constants for pure GO, Fe^{3+} and [GO-Fe^{3+}] for the degradation of RR120 degradation	56

5.6	Schematic representation of RR120 degradation by GO-Fe^{3+} hybrid nanosheets	58
5.7	Plot of sonocatalytic degradation rate constants for various concentrations of electron acceptors in the presence of a constant amount of [GO-Fe^{3+} hybrid] = 6 mg L^{-1} and [RR120] = $1.2x10^{-4}$M (a) for PMS (b) for PDS (c) for H_2O_2 and (d) for KIO_4	60
5.8	Plot of sonocatalytic degradation rate constants for various concentrations of electron acceptors [PMS, PDS, H_2O_2 and KIO_4] in the presence of a constant amount of [GO-Fe^{3+}] = 6 mg L^{-1} and [RR120] = $1.2x10^{-4}$ M	62
5.9	Plot of sonocatalytic degradation rate constants for various concentrations of inorganic ions in the presence of a constant amount of [GO-Fe^{3+}] = 6 mg L^{-1}, PMS = $3x10^{-3}$M and [RR120] = $1.2x10^{-4}$ M (a) for Na_2SO_4 (b) for Cl, (c) HCO_3 and (d) H_2PO_4	64
5.10	Comparative adsorption of inorganic ions by GO–Fe^{3+} hybrid nanosheets	66
5.11	Plot of sonocatalytic degradation rate constants for various concentrations of inorganic ions [SO_4, Cl, H_2PO_4 and HCO_3] in the presence of a constant amount of [GO–Fe^{3+}] = 6 mg L^{-1}, [PMS] = $3x10^{-3}$M and [RR120] = $1.2x10^{-4}$ M	67
6.1	XRD patterns of WO_3, WO_3-rGO1 and WO_3-rGO2	72
6.2	SEM and EDAX spectrum of the WO_3-rGO nanohybrid	73
6.3	(a) UV absorbance and (b) photoluminescence spectra of WO_3, WO_3-rGO1 and WO_3-rGO2	74
6.4	FT-IR and Raman spectra of GO, rGO and WO_3-rGO	75

6.5	TGA and DTA plots of (a) GO and (b) WO_3-rGO nanohybrid	76
6.6	Time dependent photocatalytic degradation of MO with various concentration of WO_3-rGO nanohybrid (a) WO_3-rGO1 and (b) WO_3-rGO2	78
6.7	(a) Powder X-ray diffraction pattern for β-$SnWO_4$, β-$SnWO_4$-rGO and (b) N_2-sorption isotherm of β-$SnWO_4$-rGO	79
6.8	(a, b) SEM images of leaf- like β-$SnWO_4$ and (c,d) HR-TEM images of β-$SnWO_4$	80
6.9	EDX mapping of β-$SnWO_4$–rGO nanohybrid (a& b) and the presence of elements Sn, W, O and C are clearly shown with different colors in (c), (d), (e), and (f) respectively	81
6.10	(a) Absorption spectrum of β-$SnWO_4$–rGO nanohybrid and (b) The graph for band gap calculation	82
6.11	(a) Raman spectra and (b) TGA spectra of β-$SnWO_4$, β-$SnWO_4$-rGO nanohybrid	83
6.12	Photocatalytic activity of β-$SnWO_4$-rGO against MO. (a) UV-vis absorption spectra of MO in photo degradation and (b) Concentration change profiles of MO using pure β-$SnWO_4$ and β-$SnWO_4$-rGO nanohybrid. (c) UV-vis absorption spectra of RB during the photo degradation. (d) Concentration change profiles of RB using pure β-$SnWO_4$ and β-$SnWO_4$-rGO nanohybrid	85
6.13	X-ray diffraction pattern of ZnS-rGO nanohybrid, rGO and ZnS	87

6.14	(a) SEM image of ZnS-rGO nanohybrid, (b) HR-TEM image of rGO sheet, (c) HR-TEM image and (d) EDAX analysis of ZnS-rGO nanohybrid	88
6.15	Fourier transforms infrared spectra and (b) laser Raman spectra of ZnS-rGO nanohybrid	89
6.16	Photocatalytic performance of ZnS and ZnS-rGO nanohybrid over the degradation of (a) methylene blue and (b) rhodamine B monitored by UV-vis spectroscopy. Rate kinetic profiles of (c) methylene blue and (d) rhodamine-B photodegradation using ZnS and ZnS-rGO nanohybrid	91
6.17	Schematic representation of photocatalysis process of ZnS-rGO nanohybrid	93
6.18	Photoluminescence spectra of ZnS and ZnS-rGO nanohybrid	95
6.19	Effect of different radical scavengers on the degradation of MB using ZnS-rGO nanohybrid	96
7.1	X-ray diffraction pattern of ZnO and GD-ZnO nanohybrids	99
7.2	(a) Scanning electron micrograph, (b) Transmission electron micrograph, and (c) EDAX analysis of GD-ZnO nanohybrids	100
7.3	Fourier transform-infrared spectra of ZnO and GD-ZnO nanohybrids	102
7.4	Laser Raman spectrum of GD-ZnO nanohybrid prepared by the hydrothermal method	102
7.5	X-ray photoelectron spectra of GD-ZnO nanohybrid: (a) Survey spectrum, (b) C1s spectrum, (c) Zn 2p spectrum, and (d) O1s spectrum	103

7.6	Photocatalytic performance of GD-ZnO nanohybrids and ZnO nanoparticles over the degradation of (a) methylene blue and (b) rhodamine B measured by UV−vis spectroscopy. Rate kinetic of (c) methylene blue and (d) rhodamine B photodegradation by GD-ZnO nanohybrids and ZnO nanoparticles	105
7.7	Comparative photocatalytic efficiency of GD-ZnO nanohybrids with different GD loadings	106
7.8	Photocatalytic performance of GD-ZnO nanohybrids over four consecutive cycles	107
7.9	Schematic representation of GD-ZnO nanohybrid photocatalysis	109
7.10	Photoluminescence spectra of ZnO and GD-ZnO nanohybrids	109
7.11	Total organic carbon removal of (a) methylene blue and (b) rhodamine B photodegradation using GD-ZnO nanohybrids and ZnO nanoparticles	110
7.12	(a) Photocatalytic performance of GD-ZnO nanohybrids over the degradation of phenol measured by UV-vis spectroscopy. (b) Rate kinetics of phenol degradation by GD-ZnO nanohybrids and ZnO nanoparticles	111