## LIST OF FIGURES

		Page No.
Figure 2.1.	AFM image of ormosil (A), ormosil-TiO <sub>2</sub> (B) and ormosil-TiO <sub>2</sub> -Pd (C) films.	42
Figure 2.2.	SEM image of ormosil-TiO <sub>2</sub> -Pd film.	43
Figure 2.3.	Energy dispersive spectroscopy of ormosil, ormosil-TiO <sub>2</sub> and ormosil-TiO <sub>2</sub> -Pd films. The corresponding elemental analysis is shown on bottom of respective EDS images.	43
Figure 2.4.	Ellipsometer and photographs of ormosil films on glass substrate.	44
Figure 2.5.	UV-Visible absorption spectrum of ormosil (1), ormosil-TiO2 (2) and ormosil-TiO2- Pd (2) films and inset shows their corresponding photographs.	44
Figure 2.6.	Cyclic voltammogram of (a) Ormosil(Ferri), (b) Ormosil-TiO <sub>2</sub> (Ferri) and (c) Ormosil-TiO <sub>2</sub> -Pd(Ferri) electrode in phospahate buffer (0.1M, pH 7.0) containing 0.5 M KCl at various scan rates between 0.01 and 0.5 V s <sup>-1</sup> .	45
Figure 2.7.	A plot of anodic and cathodic peak current density vs scan rate (a) and the plot of anodic and cathodic peak current density vs square root of scan rate (b) for Ormosil-TiO <sub>2</sub> -Pd(Ferri).	45
Figure 2.8.	Cyclic voltammogram of (a) Ormosil(FM), (b) Ormosil-TiO <sub>2</sub> (FM) and (c) Ormosil-TiO <sub>2</sub> -Pd(FM) electrode in phospahate buffer (0.1M, pH 7.0) containing 0.5 M KCl at various scan rates between 0.01 and 0.5 V s <sup>-1</sup> .	46
Figure 2.9.	A plot of anodic and cathodic peak current density vs scan rate (a) and the plot of anodic and cathodic peak current density vs square root of scan rate (b) for Ormosil-TiO <sub>2</sub> -Pd(FM).	46
Figure 2.10.	(A) Cyclic voltammogram of aqueous solution of ferrocene methanol (1mM) in phosphate buffer (0.1 M, pH 7.0) containing 0.5 M KCl at the scan rate of 0.01 Vs <sup>-1</sup> in absence (a) and the presence of 1 mM	49

	in phosphate buffer (0.1 M, pH 7.0) containing 0.5 M KCl at the scan rate of 0.01 V s <sup>-1</sup> in absence (a) and the presence of 1 mM ascorbic acid (b); insets to figure show the plot of current function vs. square root of scan rates for soluble ferrocene methanol (inset to (A)) and ormosil encapsulated ferrocene methanol (inset to (B)).	
Figure 2.11.	Cyclic voltammogram of (a) Ormosil(Ferri), (b) Ormosil-TiO <sub>2</sub> (Ferri) and (c) Ormosil-TiO <sub>2</sub> -Pd(Ferri) electrode in absence (1) and presence (2) of 1 mM AA in phosphate buffer (0.1M, pH 7.0) containing 0.5 M KCl at the scan rate of 10 mV/s.	50
Figure 2.12.	Cyclic voltammogram of (a) Ormosil(FM), (b) Ormosil-TiO <sub>2</sub> (FM) and (c) Ormosil-TiO <sub>2</sub> -Pd(FM) electrode in absence (1) and presence (2) of 1 mM AA in phospahate buffer (0.1M, pH 7.0) containing 0.5 M KCl at the scan rate of 10 mV/s.	50
Figure 2.13.	(A) Amperometric responses of (1) Ormosil(Ferri), (2) Ormosil-TiO <sub>2</sub> (Ferri) and (3) Ormosil-TiO <sub>2</sub> -Pd(Ferri) systems on the addition of varying concentrations (10 nM to 5 mM) of AA in 0.1 M phosphate buffer(pH 7.0) at 0.3V vs. Ag/AgCl; (B) show the corresponding calibration curves for AA analysis.	51
Figure 2.14.	(A) Amperometric responses of the (1) Ormosil(FM), (2) Ormosil-TiO <sub>2</sub> (FM) and (3) Ormosil-TiO <sub>2</sub> -Pd(FM) systems on the addition of varying concentrations (10 nM to 5 mM) of AA in 0.1 M phosphate buffer(pH 7.0) at 0.3V vs. Ag/AgCl; (B) show the corresponding calibration curves for AA analysis.	52
Figure 2.15.	Chronoamperogram of Ormosil-TiO <sub>2</sub> -Pd(Ferri) ( <b>A</b> ) and Ormosil-TiO <sub>2</sub> -Pd(FM) ( <b>B</b> ) electrodes in absence ( <b>1</b> ) and the presence ( <b>2</b> ) of 1 mM of AA in 0.1 M phosphate buffer(pH 7.0). The insets to Fig.9A and Fig.9b show the plot of $I_{cat}/I_L Vs.\ t^{1/2}$ .	53
Figure 3.1.	Photograph of TiO <sub>2</sub> nanoparticle (a) and Pd-TiO <sub>2</sub> -SiO <sub>2</sub> Nanocomposite (b).	65
Figure 3.2.	XRD of TiO <sub>2</sub> nanoparticle at 600 °C (a) and Pd-TiO <sub>2</sub> -	66

ascorbic acid (b); (B) cyclic voltammogram of ferrocene methanol encapsulated within ormosil film

SiO <sub>2</sub>	nanocom	posite	at	600	$^{\circ}C$	(h)	١.

	SiO <sub>2</sub> nanocomposite at 600 °C (b).	
Figure 3.3.	XRD of TiO <sub>2</sub> nanoparticle at 900 °C (a) and Pd-TiO <sub>2</sub> -SiO <sub>2</sub> nanocomposite at 900 °C (b).	67
Figure 3.4.	TEM image of TiO <sub>2</sub> (a) and Pd-TiO <sub>2</sub> -SiO <sub>2</sub> (b) nanocomposite calcinated at 900°C.	68
Figure 3.5.	SEM image of TiO <sub>2</sub> nanoparticle (a) and Pd-TiO <sub>2</sub> -SiO <sub>2</sub> nanocomposite (b).	69
Figure 3.6.	EDS spectra of Pd-TiO <sub>2</sub> -SiO <sub>2</sub> nanocomposite.	70
Figure 3.7.	FTIR spectra of Pd-TiO <sub>2</sub> -SiO <sub>2</sub> nanocomposite.	70
Figure 3.8.	Cyclic voltammograms of pure Pd (a), Pd-TiO <sub>2</sub> -SiO <sub>2</sub> (b) modified electrode in 1M H <sub>2</sub> SO <sub>4</sub> .	71
Figure 3.9.	Cyclic voltammograms of bare GpE (1a), TiO <sub>2</sub> modified electrode (2a), Pd-TiO <sub>2</sub> -SiO <sub>2</sub> modified electrode (3a) in 0.1 M phosphate buffer, pH 7.0 at 25 0C and their response in 1 mM Ascorbic Acid 1b, 2b,3b respectively.	73
Figure 3.10.	Cyclic voltammograms of bare Pd-TiO <sub>2</sub> -SiO <sub>2</sub> modified electrode (a) in 0.1 M phosphate buffer, pH 7.0 at 25 °C and their response in 1 mM Ascorbic Acid (b) and response in 1 mM Uric Acid (c).	73
Figure 3.11.	Typical amperometric responses of the bare GpE (a), $TiO_2$ modified electrode (b), $Pd$ - $TiO_2$ - $SiO_2$ modified electrode (c) on the addition of varying concentrations (1 to 1000 $\mu$ M) of ascorbic acid in 0.1 M phosphate buffer, pH 7.0 at 25°C and at 0.1 V vs Ag/AgCl.	74
Figure 3.12.	Calibration curves for the analysis of ascorbic acid using (a), (b), (c) and (d) systems respectively.	74
Figure 4.1.	Photograph of WO <sub>3</sub> (a), Pd-WO <sub>3</sub> -SiO <sub>2</sub> (b) and Pd-WO <sub>3</sub> -SiO <sub>2</sub> -PB (c) nanocomposite.	86
Figure 4.2.	XRD patterns of Pd-WO <sub>3</sub> -SiO <sub>2</sub> -PB nanocomposite; inset shows the XRD pattern of calcined WO <sub>3</sub> at 450 °C ( <b>A</b> ) and Pd-WO <sub>3</sub> -SiO <sub>2</sub> at 600 °C ( <b>B</b> ).	86
Figure 4.3.	TEM image of WO <sub>3</sub> , Pd-WO <sub>3</sub> -SiO <sub>2</sub> , Pd-WO <sub>3</sub> -SiO <sub>2</sub> -PB nanocomposite.	87

Figure 4.4.	FTIR Spectra of WO <sub>3</sub> , Pd-WO <sub>3</sub> -SiO <sub>2</sub> , Pd-WO <sub>3</sub> -SiO <sub>2</sub> -PB nanocomposite.	88
Figure 4.5.	The Cyclic voltamogramme of WO <sub>3</sub> ( <b>A</b> ), Pd-WO <sub>3</sub> -SiO <sub>2</sub> ( <b>B</b> ), Pure Pd ( <b>C</b> ) modified graphite paste electrode in 1M H <sub>2</sub> SO <sub>4</sub> .	88
Figure 4.6.	The Cyclic voltamogramme of WO <sub>3</sub> ( <b>A</b> ), Pd-WO <sub>3</sub> -SiO <sub>2</sub> ( <b>B</b> ), WO <sub>3</sub> -PB ( <b>C</b> ), Pd-WO <sub>3</sub> -SiO <sub>2</sub> -PB ( <b>D</b> ) and HRP coupled Pd-WO <sub>3</sub> -SiO <sub>2</sub> -PB ( <b>E</b> ) modified graphite paste electrode in absence (1) and the presence (2) of 1 mM H <sub>2</sub> O <sub>2</sub> in phospahate buffer (0.1M, pH 7.0) containing 0.5 M KCl.	92
Figure 4.7.	Typical amperometric responses of the WO <sub>3</sub> (1), Pd-WO <sub>3</sub> -SiO <sub>2</sub> (2) and WO <sub>3</sub> -PB (3) modified graphite paste electrode on the addition of varying concentrations (10 nM to 5 mM) of H <sub>2</sub> O <sub>2</sub> in 0.1 M phosphate buffer, pH 7.0 at 25 °C at 0.2 V vs Ag/AgCl.mM of H <sub>2</sub> O <sub>2</sub> by setting the step potential at 0.2 V vs. Ag/AgCl for subsequent evaluation of I <sub>cat</sub> and I <sub>L</sub> . Inset: Corresponding plots of I <sub>cat</sub> /I <sub>L</sub> vs. t <sup>1/2</sup> , supporting electrolyte 0.1 M phosphate buffer (pH, 7.0) containing 0.5 M KCl.	93
Figure 4.8.	Typical amperometric responses of the Pd-WO <sub>3</sub> -SiO <sub>2</sub> -PB (1) and Pd-WO <sub>3</sub> -SiO <sub>2</sub> -PB-HRP (2) modified graphite paste electrode on the addition of varying concentrations ( 10 nM to 5 mM) of H <sub>2</sub> O <sub>2</sub> in 0.1 M phosphate buffer, pH 7.0 at 25 <sup>0</sup> C at 0.2 V vs Ag/AgCl.	93
Figure 4.9.	Calibration curve for H <sub>2</sub> O <sub>2</sub> analysis over Pd-WO <sub>3</sub> -SiO <sub>2</sub> -PB (1), and Pd-WO <sub>3</sub> -SiO <sub>2</sub> -PB-HRP (2) modified graphite paste electrode.	94
Figure 4.10.	The chronoamperograms for the WO <sub>3</sub> ( <b>A</b> ), Pd-WO <sub>3</sub> -SiO <sub>2</sub> ( <b>B</b> ) and Pd-WO <sub>3</sub> -SiO <sub>2</sub> -PB ( <b>C</b> ) modified electrodes in absence (1) and the presence (2) of 1 mM of H <sub>2</sub> O <sub>2</sub> by setting the step potential at 0.2 V vs. Ag/AgCl for subsequent evaluation of I <sub>cat</sub> and I <sub>L</sub> . Inset: Corresponding plots of I <sub>cat</sub> /I <sub>L</sub> vs. t <sup>1/2</sup> , supporting electrolyte 0.1 M phosphate buffer (pH, 7.0) containing 0.5 M KCl.	94
Figure 4.11.	Photographs showing the production of colored	97

	product upon the addition of WO <sub>3</sub> nanosuspension to: (i) o -dianisidine, (ii) pyrogallol, and (iii) phenol at pH 7.0.	
Figure 4.12.	(a) Photographs showing the production of colored product upon the addition of Pd-WO <sub>3</sub> -SiO <sub>2</sub> -PB nanosuspension to o –dianisidine in phosphate buffer at pH 7.0. (b) A simple absorbance spectra corresponding to o-dianisidine oxidation product.	97
Figure 4.13.	Time dependent absorbance evaluation at 430 nm corresponding to o-dianisidine oxidation product as; (a) without catalyst, (b) WO <sub>3</sub> , (c) Pd-WO <sub>3</sub> -SiO <sub>2</sub> , and (d) Pd-WO <sub>3</sub> -SiO <sub>2</sub> -PB.	98
Figure 4.14.	Photographs showing the production of colored product upon the addition of varying concentration of $H_2O_2$ .	98
Figure 4.15.	The steady state kinetic assay of WO <sub>3</sub> (a) Pd-WO <sub>3</sub> -SiO <sub>2</sub> (b) and Pd-WO <sub>3</sub> -SiO <sub>2</sub> -PB (c) nanosuspension with H <sub>2</sub> O <sub>2</sub> as substrate.	99