Supplementary Information

Polyethyleneimine Assisted Formation of Ag-SiO_2 Hybrid Microspheres for H_2O_2 Sensing and SERS Applications

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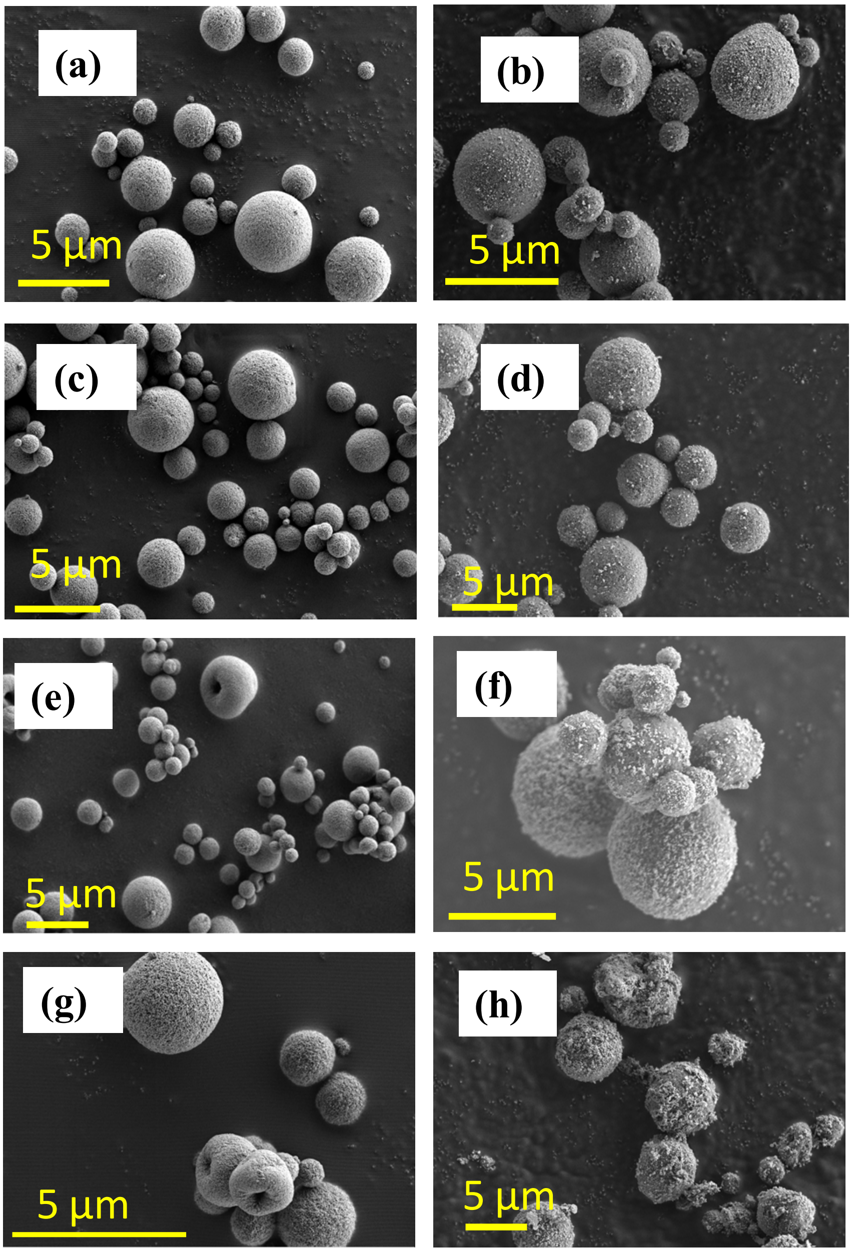

Figure S1: *FESEM micrographs of silica-PEI microspheres and Ag-SiO_2 microspheres (a) Si-p5; (b) Si-p5-Ag (c) Si-p11; (d) Si-p11-Ag; (e) Si-p20; (f) Si-p20-Ag; (g) Si-p33; (h) Si-p33-Ag.*

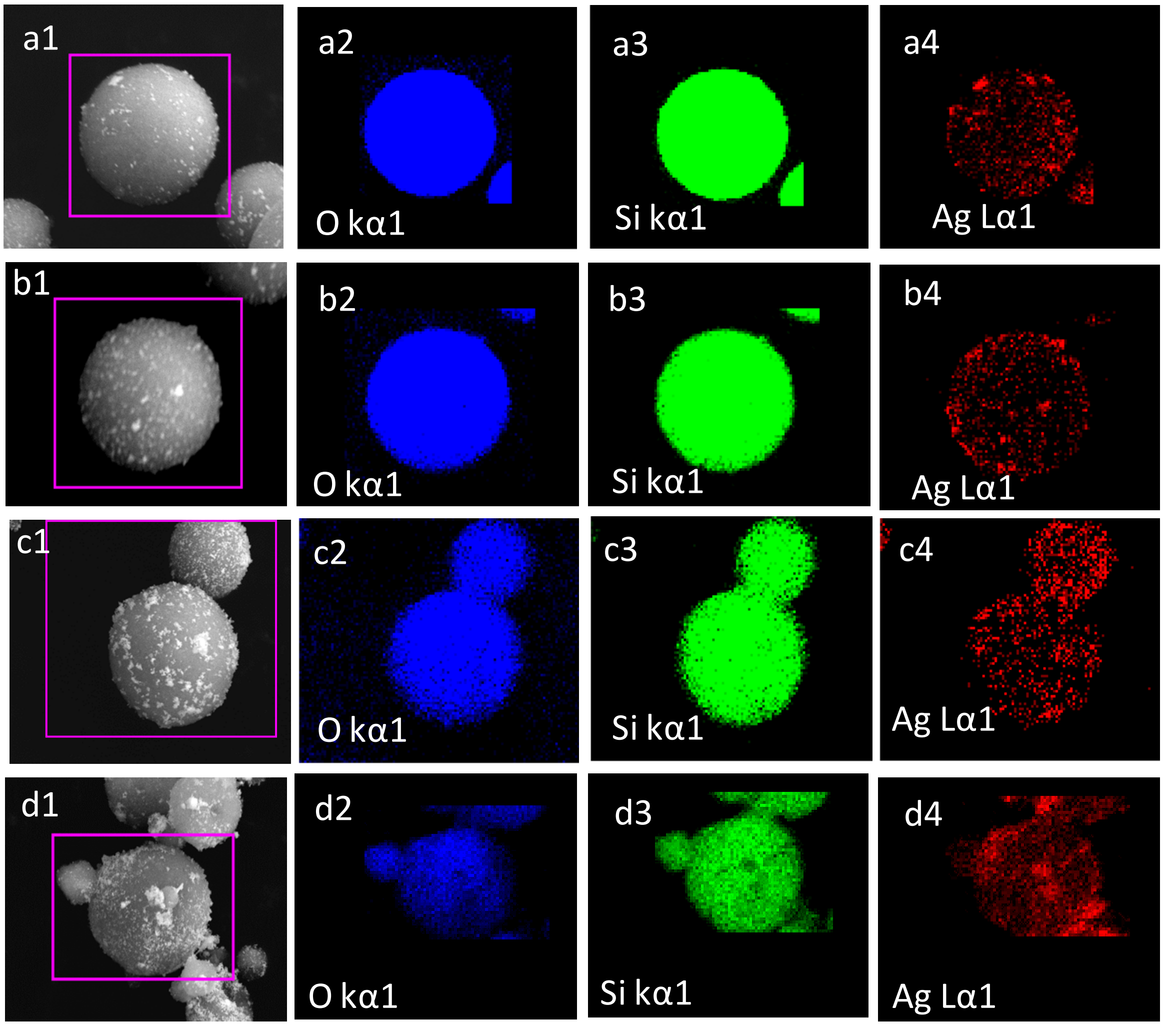

Figure S2: *Energy Dispersive X-ray elemental mapping of Ag-SiO_2 microspheres obtained for (a) 5 wt% (b) 11 wt% (c) 20 wt% (d) 33 wt% PEI loading*

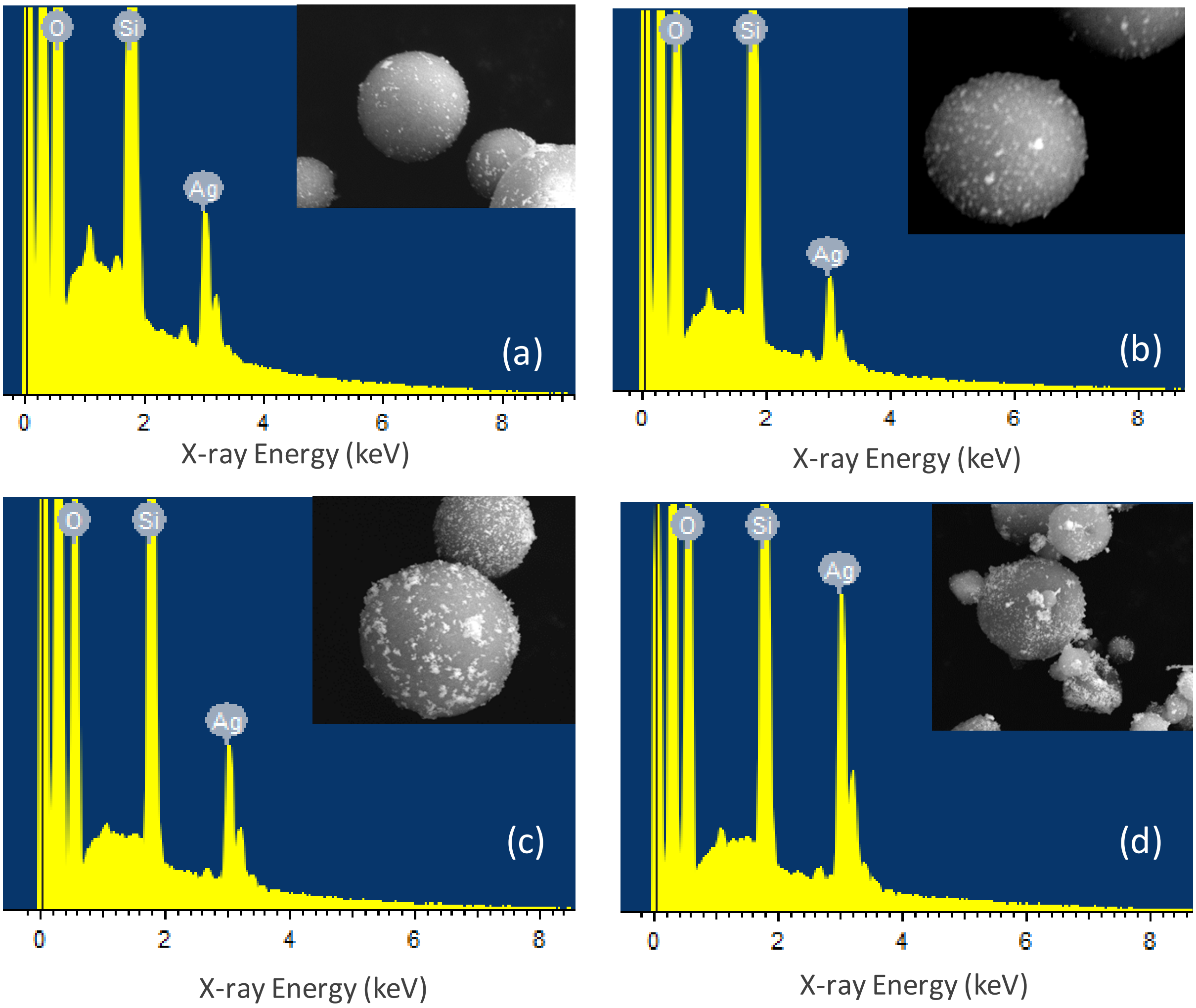

Figure S3: *Energy Dispersive X-ray (EDX) spectra of Ag-SiO_2 microspheres obtained for (a) 5 wt% (b) 11 wt% (c) 20wt% (d) 33 wt% PEI loading*

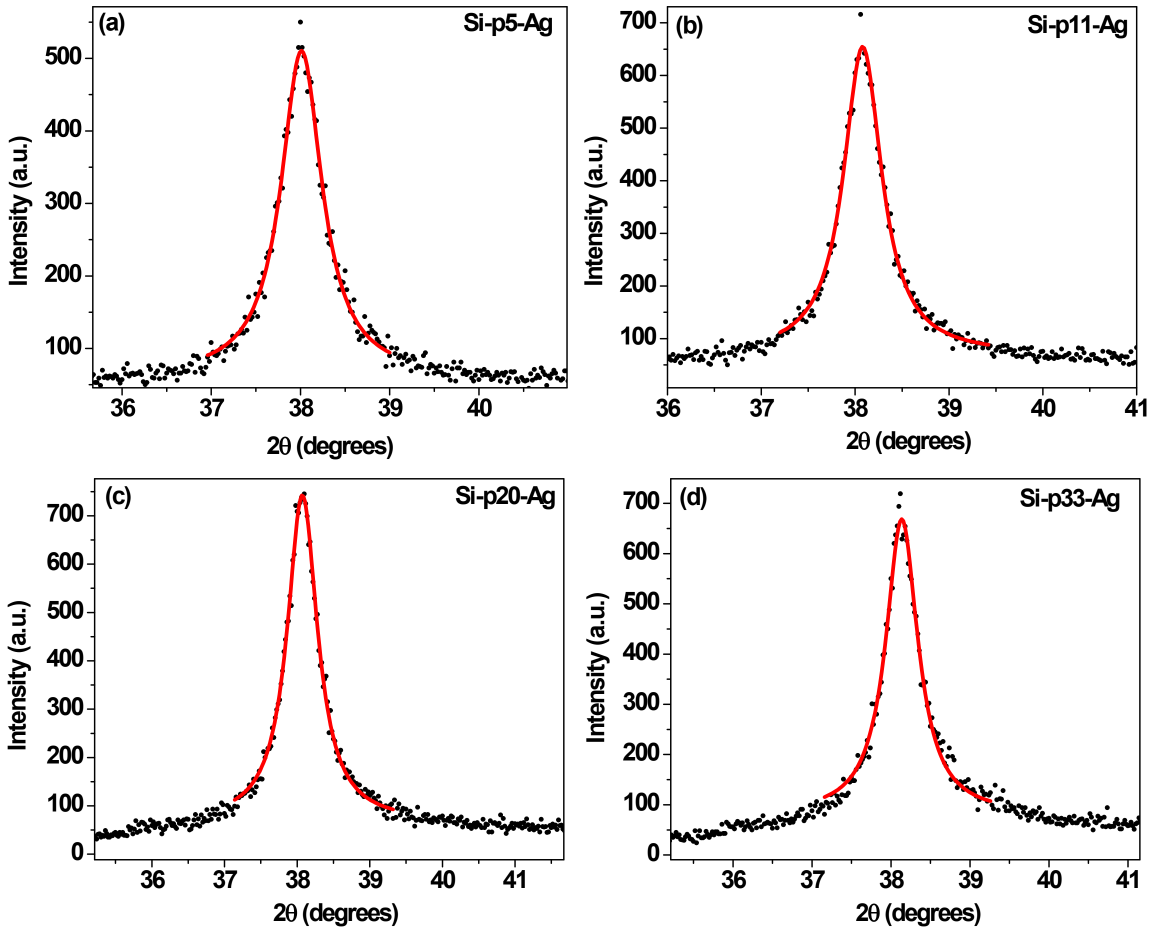

Figure S4: *Lorentzian fit of the (111) peak of the XRD data for the Ag-SiO_2 microspheres.*

Figure S5: *UV-Visible spectrum of Ag-SiO_2 microspheres composite dispersed in water*

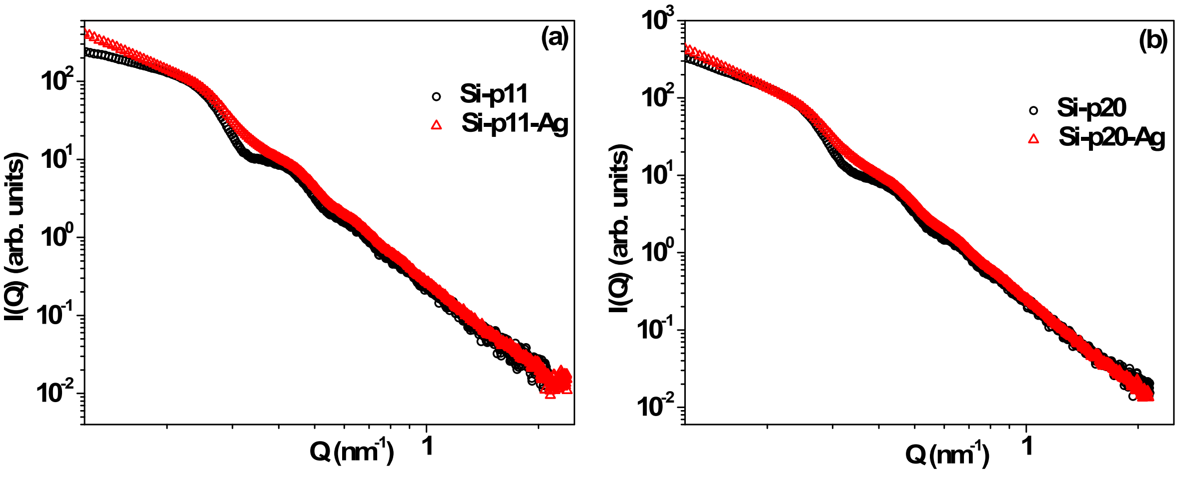

Figure S6: *Comparison of SAXS profiles of silica-PEI and Ag-SiO$_2$ microspheres for (a) 11 wt% (b) 20 wt% PEI loading. Hollow circles (black) represent the SAXS data of pristine silica-PEI microspheres while profiles shown with hollow triangles (red) indicate SAXS data of Ag-SiO$_2$ microspheres.*

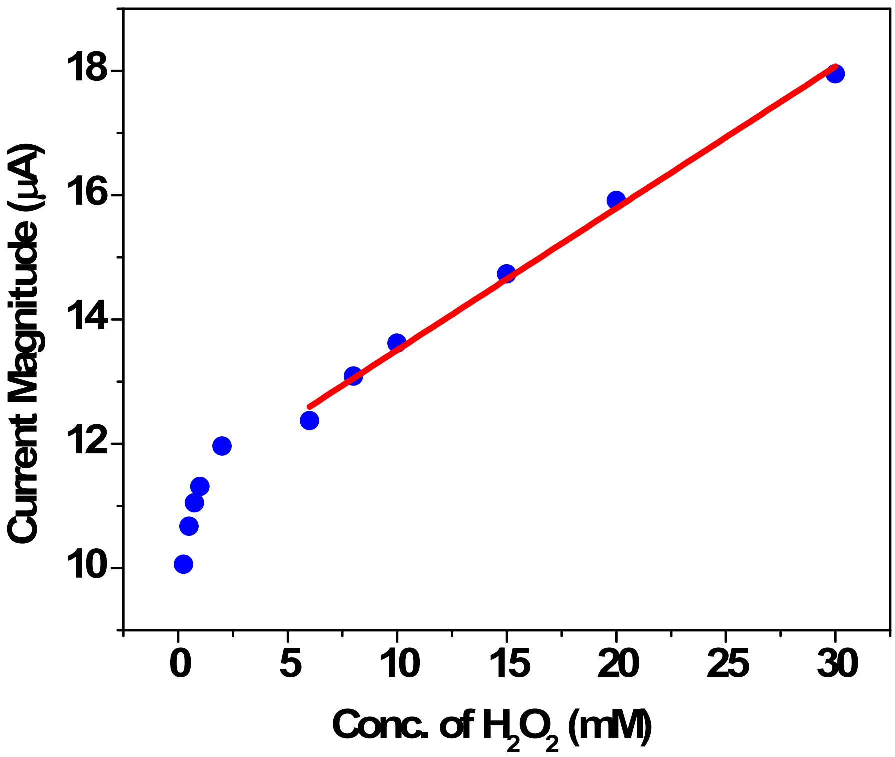

Figure S7: *Variation in the magnitude of reduction current peak with H_2O_2 concentration. Solid line represents the fitting of the linear range of the variation in current versus concentration of H_2O_2.*

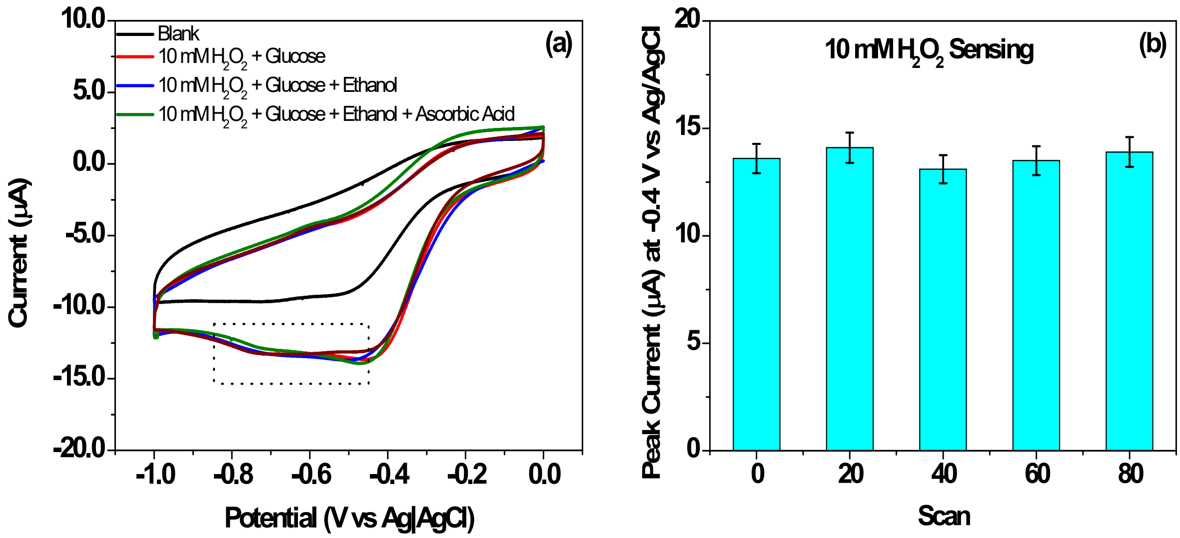

Figure S8: (a) CV measurements for the electrochemical detection of 10 mM H_2O_2 in the presence of various interfering agents (glucose, ethanol, ascorbic acid). (b) Current corresponding to the reduction peak potential at -0.4 V vs Ag|AgCl with varying CV scans.

Table S1: *Comparison of Ag nanoparticles-based sensor for electrochemical sensing of H_2O_2*

	Reductant source	Analyte Detected	LOD	Reference
Silver Nanoparticles	Polyethyleneimine	H_2O_2	1.08 mM	This Study
	Lavender leaf extract	H_2O_2	------	[1]
	Dextrose	H_2O_2	------	[2]
	Locust Bean Gum Polysaccharide	H_2O_2	-------	[3]
	Starch	H_2O_2	0.9 µM	[4]
	Euphorbia hirta (AEE) leaf extract	H_2O_2	10^{-7} M	[5]

	Agar & Ascorbic acid	H_2O_2	0.03 μM	[6]
	Tea Extract	H_2O_2	0.73 μM	[7]
	Isoimperatorin	H_2O_2	0.036 μM	[8]

Figure S8: *Schematic for the instrumentation of Raman scattering measurements carried out on Ag-SiO_2 microspheres*.

Table S2: *Comparative study of the distinct support materials for Ag nanoparticles used as SERS substrates*

Support Material	Probe Molecule	LOD	Reference
Ag@SiO2 Microsphere	Rhodamine 6G (R6G)	10^{-6} M	This study
Ag@ SiO2	Prostate Specific Antigen (PSA)	0.11 pg/mL	9
PDMS + lotus leaves	Triazophos	10^{-8} M	10
Adhesive tape	Triazophos	25 ng/cm^2	11
Cotton Swabs	Thiabendazole	1 ng/cm^2	12
PDMS	Thiram	10^{-5} M	13
PDMS+PS microsphere	Thiram	10^{-10} M	14

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