Submicron silica spheres decorated with silver nanoparticles as a new effective sorbent for inorganic mercury in surface waters

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Electronic Supplementary Material (ESI) for Analyst

Table 1S. Instrumental parameters for Thermo Scientific, XSeries 2 ICP-MS spectrometer

RF Power	1.4 kW
Argon flow rates:	
Cool gas	14 L min^{-1}
Auxiliary gas flow	0.65 L min^{-1}
Nebulizer gas flow	0.85 L min^{-1}
Nebulizer	Concentric
Sample uptake	0.6 mL min^{-1}
Uptake and wash time	60 s
Integration time	0.3 s
Replicates	3
Dwell time per isotope	20 ms
Sample uptake and wash time	60 s

Table 2S. Sampling sites, Geographical coordinates: site 1 (river Iskar, 42°49'14"N, 23°22'13"); site 2 (river Maritsa, 42°16’33'24.5N, 23°41’06.17E); site 3 (Black sea Krapets, 43°36'60.0"N, 28°35'60.0"E); site 4 (Black sea Kamtchia (esuarine water): 43°00'60.0"N, 27°53'60.0") and characteristics.

Sample sites	pH	Dissolved O_2 (mg L^{-1})	NO_3^- (μM)	NO_2^- (μM)	HPO_4^{2-} (μM)	DOC (mg L^{-1})
Site 1 river Iskar*	7.3	8.2	7	0.04	0.9	4.5 ± 0.1
Site 2 river Maritsa**	7.2	7.9	6	0.02	0.6	5.6 ± 0.2
Site 3 Black sea Krapets***	8.1	7.3	8	0.04	0.6	2.5 ± 0.2
Site 4 Black sea Kamtchia	8.0	7.7	9	0.03	0.5	2.9 ± 0.2

* Values of major chemical components:[Ca^{2+}] = 0.4 mM, [Mg^{2+}] = 0.2 mM, [Cl^-] = 0.2 mM.

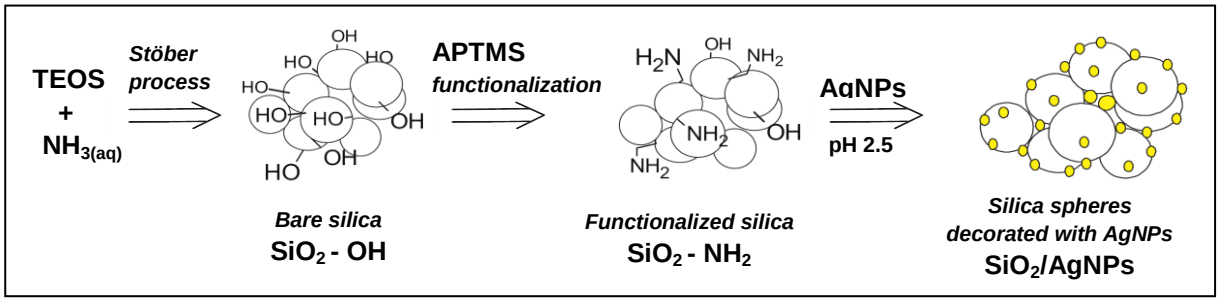
** Values of major chemical components: [Ca^{2+}] = 0.95 mM, [Mg^{2+}] = 0.25 mM, [Cl^-] = 0.1 mM.

*** The values of major chemical components of Black seawater have not varied significantly with sampling location; averaged concentrations:[Ca^{2+}] = 5.8 mM, [Mg^{2+}] = 0.026 M, [Cl^-] = 0.27 M.

Table 3S. SAED data of SiO_2/AgNPs sorbent particles after exposure to 1 μg iHg solution; $(hkl)_f$—double electron diffraction effects; SAED interpretation: accuracy 1%

d (A°)	Relative intensity	Ag PDF 89-3722 a = 4.0855(1) Å SG $Fm\bar{3}m$	Ag PDF 87-0598 a = 2.8862 Å, c = 10.000 Å $P6_3/mmc$	Ag_2Hg_3 PDF 65-3156 a = 10.0506 Å SG I23	Hg PDF 01-1017 a = 3.459 Å, c = 6.699 Å SG R
2.789	m	-	-	$(320)_f$	101
2.390	s	111	101	330, 411	-
2.063	s	200	-	422	-
1.424	m	-	-	-	021
1.255	m	311	008	800	-
1.035	m-w	400	-	932	-

s — strong; m — middle; m-w — middle weak



Scheme S1 Formation of silica-silver nanocomposite structure by functionalization of the core surface and chemisorption of preformed silver nanoparticles (colloid mixing method)

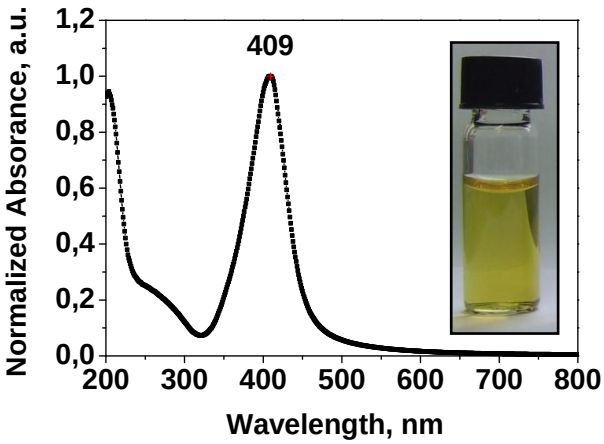


Fig. S1 UV-Vis absorbance spectrum of starch-stabilized silver nanoparticles in colloidal solution (with inset of a photograph)

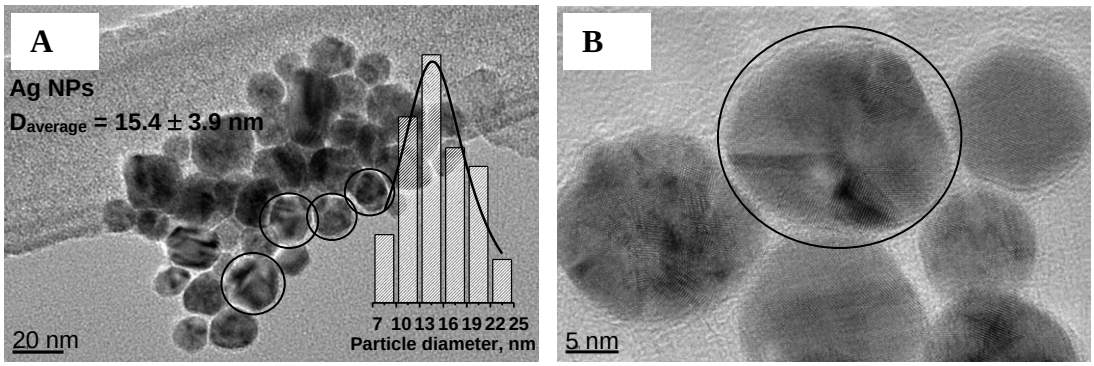


Fig. S2 (A) TEM image (with inset of a size distribution histogram determined by counting of 150 particles using Image J software) and (B) HRTEM image of preformed starch-stabilized silver nanoparticles. Some polyhedral nanoparticles are surrounded by circles.

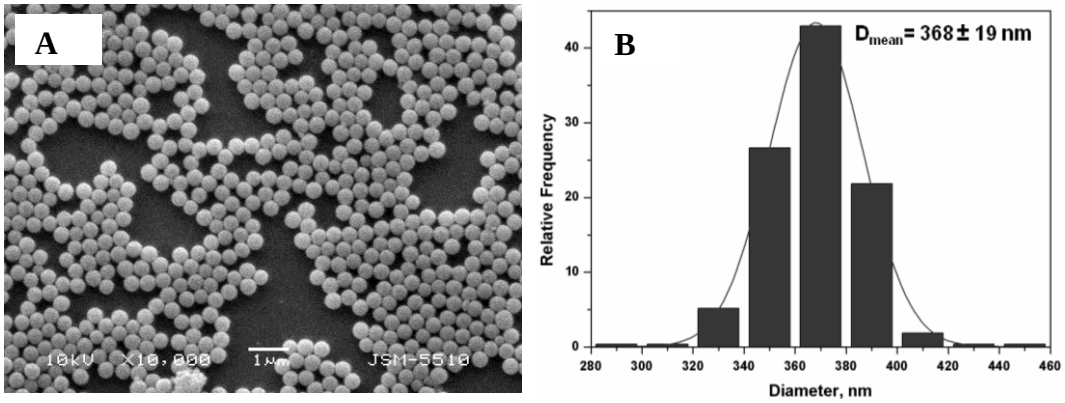


Fig. S3 (A) SEM image and (B) particle size distribution histogram of SiO_2-NH_2 determined by counting of 450 particles using Image J software

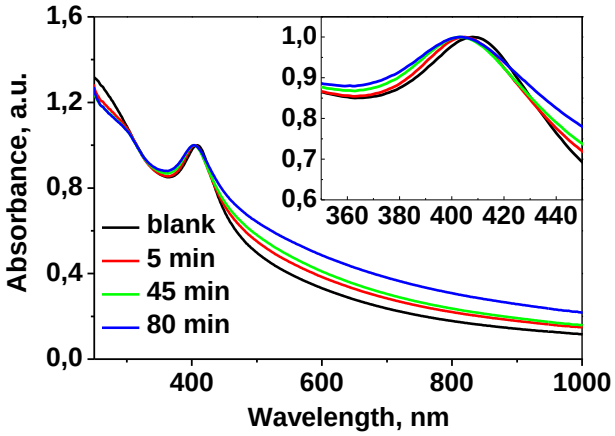


Fig. S4 UV-Vis absorption spectral changes observed for SiO_2/AgNPs aqueous dispersion upon the addition of iHg solution