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Supplementary Material:

Dissolution, fate and ecological risk assessment of silver nanoparticles in presence of natural aquatic organic matter

MAIN TEXT

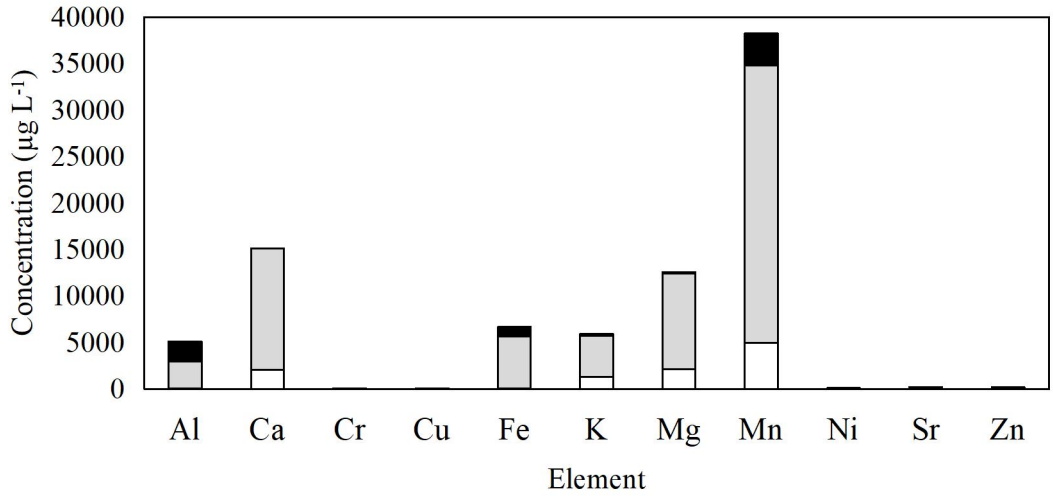
Detailed information about procedures and media composition are available in this section. The Algae and Daphnia media composition solutions produced through all experiments needed are described in Supplementary Table 1.

The values of *in-situ* measurements from Rio Sorocabinha samples are presented in Supplementary Table 2.

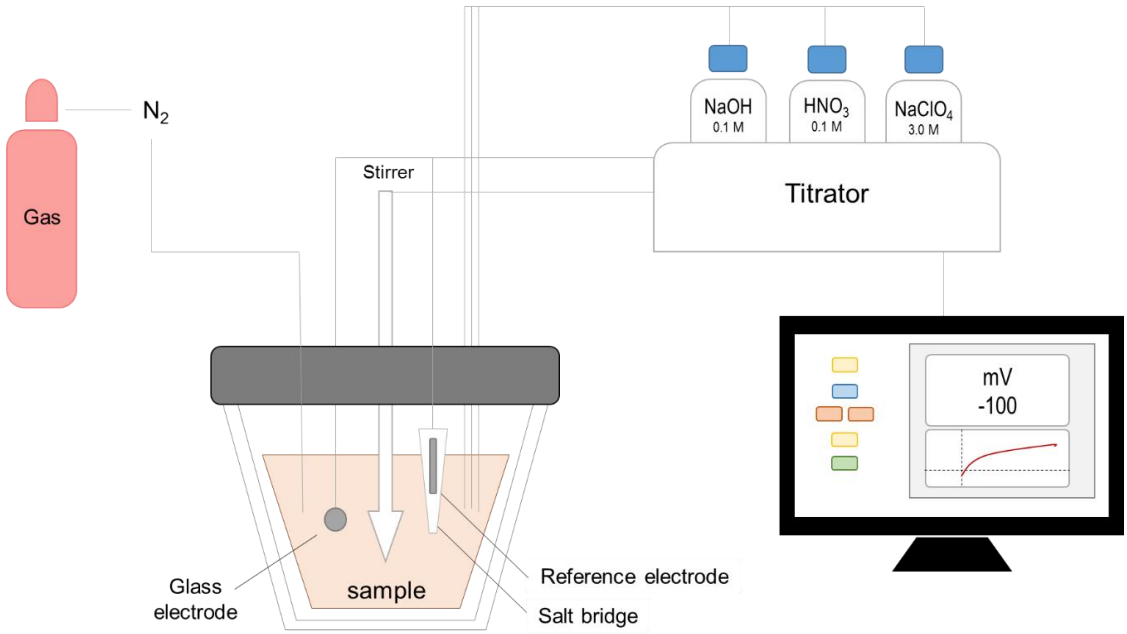
According to the metal content [Supplementary Figure 1], the Rio Sorocabinha water samples had high amounts of Al, Ca, Fe, K, Mg, and Mn as well as low concentrations of Cr, Cu, Ni, Sr, and Zn. Most part of the metals found are distributed in the dissolved fraction, and only a minor amount was found in their free form or in small complexes. Some environmental binders, like HS found in the dissolved component of the aquatic environment, may facilitate the transport of metals in microalgae, indirectly affecting other aquatic organisms, for instance because of trophic transfer chains. As a result, the findings of metals in water samples that have the NOM to be researched help to develop a hypothesis regarding the interaction of HS and interactions that will be conducted alongside metallic nanoparticles.

The Supplementary Table 3 provides the outcomes of the digestion of HS and EPS. Al and Fe are present in significant amounts in the humic substances. In fluids high in humic hydrocolloid, metals like manganese, copper, cadmium, and nickel are frequently found. [1] Silver was never above the detection threshold in either the HS or EPS extract.

For titration methodology, to proceed with a calibration just under initial circumstances, 15 mL of Milli-Q water and 15 mL of $NaClO_4$ 0.01 M solution were transferred in a reactor. The titration system is made consisting of a reference electrode and nitrogen (N_2) atmosphere, as shown in Supplementary Figure 2. After obtaining the calibration titration, combine the same quantity of Milli-Q water and 0.01 mol L^{-1} $NaClO_4$.



Supplementary Figure 1. Results of measurements of metals present in the water collected to obtain HS extracts. Black bar = complexed metals; gray bar = dissolved metal; transparent bar = free metal plus small complexes lower than 1 kDa.



Supplementary Figure 2. General schematic titration system used for phenolic and carboxylic groups determination.

Supplementary Table 1. Composition of Algae and Daphnia media exposed solution based on reagents and respcetively molar concentration

Media type	Reagent	C/mol L^{-1}
Algae	$Ca(NO_3)_2.4H_2O$	1.69E-04
	KNO3	9.89E-04
	$MgSO_4.7H_2O$	1.22E-04
	K_2HPO_4	2.30E-04
	$CuSO_4.5H_2O$	6.01E-08
	$(NH_4)_6Mo_7O_{24}.4H_2O$	2.43E-08
	$ZnSO_4.7H_2O$	1.04E-07
	$CoCl_2.6H_2O$	1.26E-07
	$Mn(NO_3)_2.4H_2O$	1.20E-07
	H_3BO_3	4.85E-07
	$C_6H_5FeO_7.5H_2O$	2.43E-06
	$FeCl_3.7H_2O$	1.08E-06
	$FeSO_4.7H_2O$	1.12E-06
	$NaHCO_3$	1.79E-04
Daphnia	$Ca(SO)_4.2H_2O$	1.92E-04
	KCl	2.95E-05
	$MgSO_4.7H_2O$	2.72E-04
	$NaHCO_3$	6.29E-04

Supplementary Table 2. Characterization of surface waters of Sorocabinha River, Sao Paulo, Brazil.

Parameter	Meausurement
Electrical conductivity (µS cm^{-1})	136.0
DBO_5 (mg L^{-1})	0.54
OD (mg L^{-1})	1.91
pH	5.8
Temperature (ºC)	23.5
TOC (mg L^{-1})	56.9

Supplementary Table 3. Metal composition of HS and EPS

Element	Concentration (mg kg^{-1})	
	EPS	HS
Ag	<LOQ	<LOQ
Al	3.8±0.6	177.3
As	<LOQ	<LOQ
Cd	<LOQ	<LOQ
Co	<LOQ	<LOQ
Cr	<LOQ	0.251±0.001
Cu	<LOQ	<LOQ
Fe	<LOQ	1051.76±14.7
Mn	<LOQ	7.1±0.4
Ni	2.95±0.003	<LOQ
Pb	<LOQ	<LOQ

LOQ: Limit of quantification.

References

1. Rosa AH., Goveia D, Bellin IC. et al. Estudo da labilidade de Cu(II), Cd(II), Mn(II) e Ni(II) em substâncias húmicas aquáticas utilizando-se membranas celulósicas organomodificadas. *Química Nova* 2007;30;59-65.