

Supporting information

Contribution of single particle inductively coupled plasma mass spectrometry and asymmetrical flow field flow fractionation to the characterization of silver nano-suspensions. Comparison with other sizing techniques.

S. Motellier*, N. Pelissier, J.G. Mattei

Table S-1: ICP-MS experimental conditions

RF power (W)	1550
Plasma gas (Ar) flow rate (L min⁻¹)	15
Carrier gas (Ar) flow rate (L min⁻¹)	1.15
Sampling depth (mm)	7.5
Integration time / mass (s)	0.003 (sp mode) or 1(AF4)

Table S-2: AF4 method

Detector flow (mL min⁻¹)	1
Injection flow (mL min⁻¹)	0.2
Focus flow (L min⁻¹)	0.5
Injection time (min)	5
Elution	Constant cross flow 1mL min ⁻¹ during 1 min, then exponential crossflow decrease to 0.1 mL min ⁻¹ for 20 min

Table S-3: Comparison of the particle diameters as determined by the different techniques.

Definitions of diameters in Table 1. All values in nm.

	Ag AL 20nm	Ag AL 60nm	Ag AL 100nm	Ag Citrate	Ag PEG
TEM	21.9 ± 2.4 (n=102)	60.9 ± 4.8 (n=103)	102.4 ± 7.6 (n=102)	18.1 ± 8.4 (n=452)	19.0 ± 7.5 (n=1134)
D_{area}					
DLS	35.4 ± 1.8	73.2 ± 0.5	126.3 ± 3.1	37.5 ± 1.5	65.3 ± 2.2
D_h					
sp-ICP-MS	20.3 ± 0.5	54.2 ± 0.6	96.6 ± 4.6	31.1 ± 1.3	30.3 ± 0.7
D_{mass} average					
sp-ICP-MS	19.0 ± 1.4	55.5 ± 0.7	93.0 ± 1.4	24.0 ± 2.8	25.0 ± 1.4
D_{mass} mode					
AF4-ICP-MS	27.4 ± 1.4	74.5 ± 1.5	107.5 ± 2.5	34.1 ± 1.2	45.3 ± 1.9
D_t average					
AF4-ICP-MS	20.1 ± 1.3	59.0 ± 1.4	80.8 ± 1.3	25.2 ± 1.4	44.4 ± 1.7
D_t mode					
AF4-MALLS	32 ± 14	44 ± 7	68 ± 17		
D_{rms}					

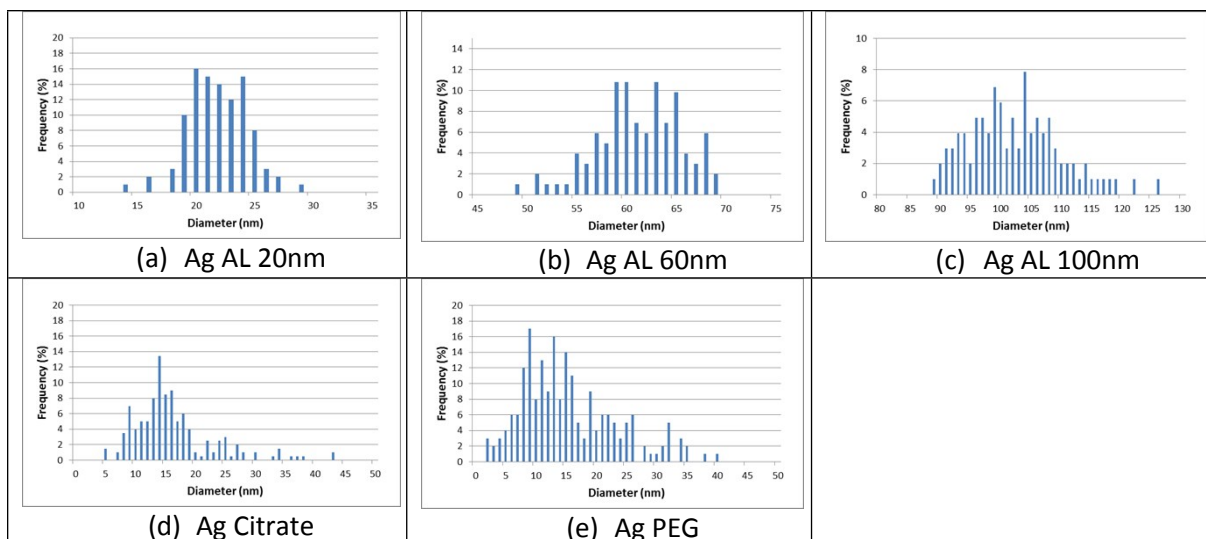


Fig. S-1: Size distributions (in number) determined by TEM. (a) Ag AL 20nm, (b) Ag AL 60nm, (c) Ag AL 100nm, (d) Ag Citrate, and (e) Ag PEG.

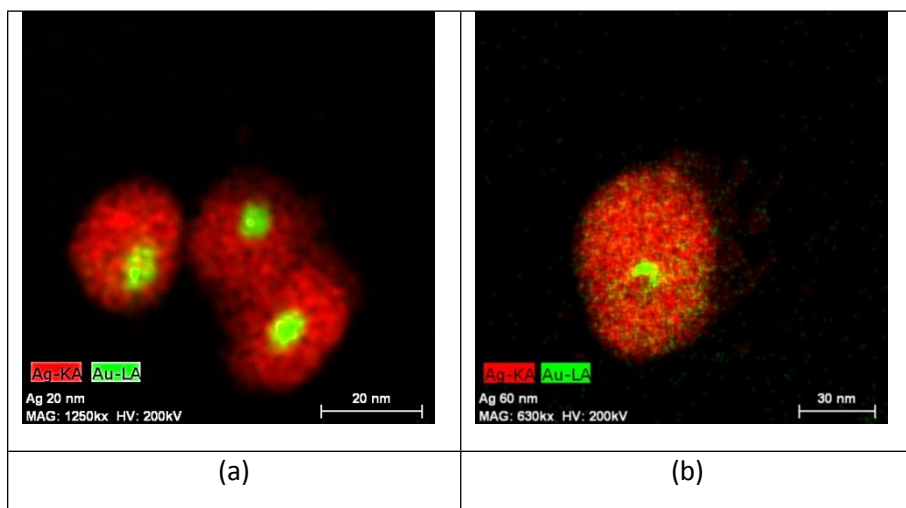


Fig. S-2: EDS element maps of Ag AL NPs. (a) Ag AL 20nm, (b) Ag AL 60nm. Ag in red and Au in green.

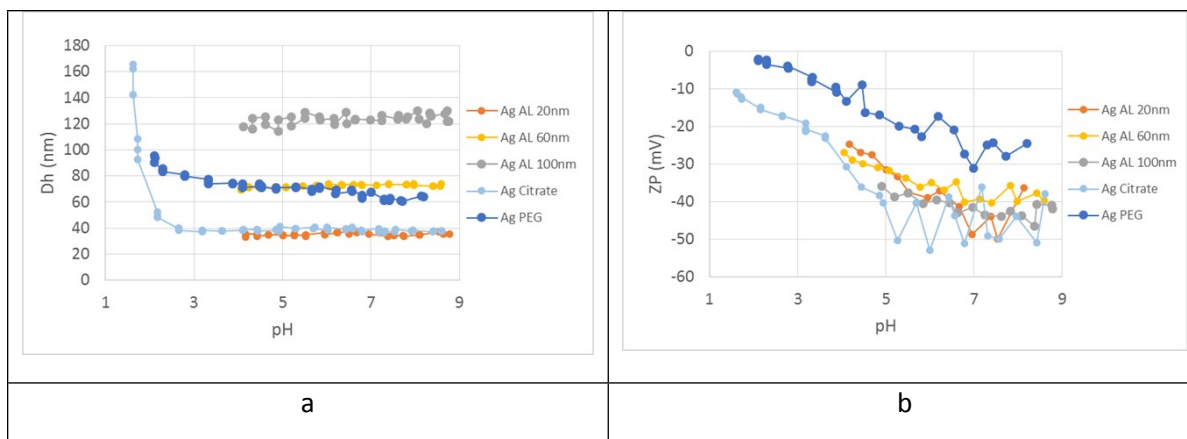


Fig. S-3: Evolution of (a) the z-averaged hydrodynamic diameter (D_h) and (b) the zeta potential (ZP) as a function of pH for Ag NPs in suspension. Experimental conditions: [Ag NPs] = 4 mg L⁻¹ in NaNO₃ 1 mM, pH scan in decreasing pH order.

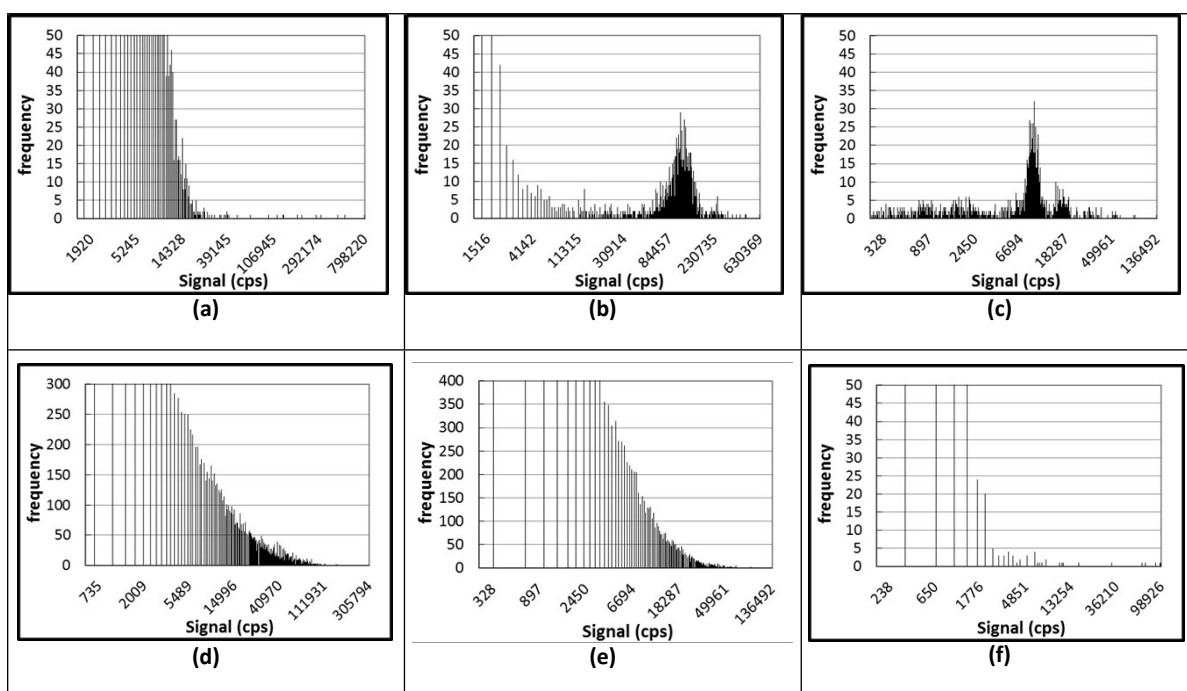


Fig. S-4: spICP-MS intensity histograms for (a) Ag AL 20 nm, (b) Ag AL 60 nm, (c) Ag AL 100 nm, (d) Ag Citrate, and (e) Ag PEG. (f): histogram showing the background signal for UP water. Sample concentration: 50 ng L⁻¹ (Ag AL 20nm and Ag PEG); 125 ng L⁻¹ (Ag AL 60nm and Ag Citrate), and 4 μ g L⁻¹ (Ag AL 100nm) in UP water.

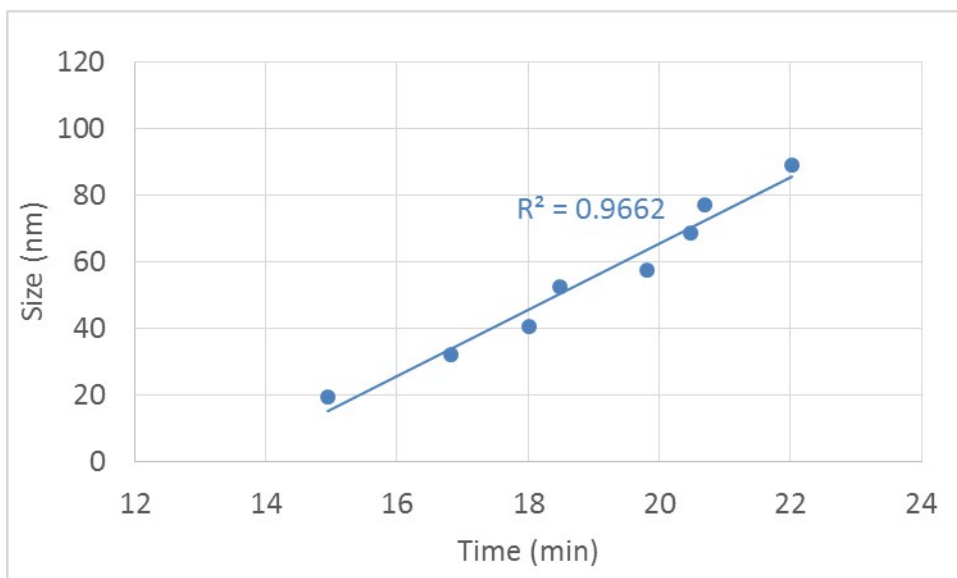


Fig. S-5: Size calibration of the elution time in AF4 analyses. Elution time at the peak maximum. The size corresponds to the TEM diameter (provided by the supplier) of the Ag NPs.