## **Supplementary Information**

## Anchoring of Silver Nanoparticles on Graphite and Isomorphous Lattices

*Rita Patakfalvi*<sup>1</sup>, *David Diaz*\*<sup>1</sup>, *Patricia Santiago-Jacinto*<sup>2</sup>, *Geonel Rodriguez-Gattorno*<sup>1,4</sup> and *Roberto Sato-Berru*<sup>3</sup>

 <sup>1</sup>Facultad de Química, <sup>2</sup>Instituto de Física, <sup>3</sup>Centro de Ciencias Aplicadas y Desarrollo Tecnológico, Universidad Nacional Autónoma de México. Coyoacán, 04510, México D.F., México,
 <sup>4</sup>Departamento de Física Aplicada, Centro de Investigaciones Avanzadas del IPN, Mérida 97310, Yucatán, México.

The operation of the **Mütek PCD 03** Particle Charge Detector is based on the streaming potential measurement. The central element of the equipment is a cylindrical teflon measuring cell with a fitted displacement piston. A defined narrow gap is provided between cell wall and piston. If the measuring cell is filled with a suspension, the suspended solid particles will adsorb onto the surface of the piston and on the cell walls under the action of van der Waals forces. The counter-ions remain comparatively free. Driven by a motor, the piston oscillates in the measuring cell and creates an intensive liquid flow which entrains the free counter-ions, thus separating them from the adsorbed sample material. This partial separation of charges induces the streaming potential, which the instruments can measure directly in mV. The sign of the measured value indicates whether the particle is positively or negatively charged. The measured potential is a relative parameter.

For example: In this work we are reporting two different values of streaming potential for N, N'dimethylformamide (-285 in the text, and -385 mV here in the Table S1). The measurements are quite sensitive to the temperature and cell cleanliness. Taking in account the relativity of this parameter, prior to measuring the streaming potential of each sample, we separate a small volume of the same DMF lot and we take the corresponding value of the solvent in each case.

To confirm the interpretation of the different composite formation the following experiments were carried out. Ag nanoparticles (NPs) were synthesized with the same procedures as in the manuscript, only without solid support.

**Method 1.** Appropriate amount of Na-citrate (final concentration:  $10^{-4}$  M) was dissolved in a minimum amount of water, and then in 50 mL *N*,*N*'-dimethylformamide (DMF, previously bubbled with argon). After the complete dissolution of Na-citrate, an adequate amount of silver 2-

ethylhexanoate (Ag(ethex),  $10^{-4}$  M) was added to the reaction solution, under vigorous stirring. The solution was heated at 60 °C during 20 minutes.

**Method 2.** Appropriate amount of  $AgNO_3$  (10<sup>-4</sup> M) was dissolved in 50 mL DMF (previously bubbled with argon). The solution was heated at 60 °C during 20 minutes.

**Method 3.** Appropriate amount of Na-citrate (final concentration:  $10^{-4}$  M) was dissolved in a minimum amount of water, and then in 50 mL DMF (previously bubbled with argon). After the complete dissolution of Na-citrate, an adequate amount of AgNO<sub>3</sub> ( $10^{-4}$  M) was added to the reaction solution, under vigorous stirring. The solution was heated at 60 °C during 20 minutes.

Stable Ag NPs were synthesized with Method 1 and Method 3. The nanoparticle formation was followed by UV-visible spectroscopy. The corresponding spectra show symmetric plasmon resonance bands increasing with the reaction time (Figure S1 and S3). However, applying the Method 2 silver mirror was formed on the beaker walls (Figure S2).



**Figure S1**. Evolution of UV-visible spectrum during the formation of Ag nanoparticles in DMF (10<sup>-4</sup> M Ag-2-ethylhexanoate, 10<sup>-4</sup> M Na-citrate; Method 1)



**Figure S2**. Evolution of UV-visible spectrum during the formation of Ag nanoparticles in DMF (10<sup>-4</sup> M AgNO<sub>3</sub>; Method 2)



**Figure S3**. Evolution of UV-visible spectrum during the formation of Ag nanoparticles in DMF ( $10^{-4}$  M AgNO<sub>3</sub>,  $10^{-4}$  M Na-citrate; Method 3)

The particle surface charge of the prepared Ag NPs was determined by Mütek PCD 03 Particle Charge Detector (Table S1).

 Table S1. Streaming potentials of the prepared Ag sols measured by Mütek PCD 03 Particle Charge

 Detector

	Streaming potential (mV)
DMF	-385
Ag NPs in DMF (10 <sup>-4</sup> M Ag-2-ethylhexanoate, 10 <sup>-4</sup> M Na-citrate)*	-420
Ag NPs in DMF $(10^{-4} \text{ M AgNO}_3)$ (measured after 1 hour)	+53
Ag NPs in DMF (10 <sup>-4</sup> M AgNO <sub>3</sub> , 10 <sup>-4</sup> M Na-citrate)*	-272

\*Streaming potential measured after 2 days.

As we mentioned in the manuscript, the graphite-DMF and  $MoS_2$ -DMF suspensions have a negative streaming potential. The citrate and 2-ethylhexanoate stabilized Ag NPs have also negative charge; that is why, less particles could form on the substrate surface. But without any stabilizer, the Ag(I) cations and the formed Ag particles have more affinity toward the substrate surface.