

Gold nanoparticles obtained by pulsed laser ablation in liquids: formation of monolayers on chemically functionalized patterns/substrates

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The advantages of nanoparticles (NPs) synthesized by pulsed laser ablation in liquids (PLAL) include chemical purity, high colloidal stability without capping agent due to a charged surface [1], a possibility of efficient *in situ* (bio)conjugation [2,3], and others. In the present work we show that not only colloidal solutions, but also layers formed by Au NPs synthesized by PLAL method demonstrate advantages as compared to those formed by chemically synthesized Au NPs bearing charged ligands. It is worth noting that high-quality immobilization of NPs on solid substrates is crucially important for development of solid-state nanotechnology.

We investigated the deposition of Au NPs on a thiol-terminated glass substrate functionalized with (3-mercaptopropyl) triethoxysilane and used two types of AuNPs synthesized by (1) pulsed laser ablation in a water/isopropanol mixtures ($d \approx 10$ nm, Au-PLAL), and (2) standard citrate-based chemical route ($d \approx 16$ nm, Au-chem) and compare the quality of the resulting AuNP layers. As Fig. 1 shows, Au-PLAL forms homogeneous layers, whereas deposition of Au-chem results in poor homogeneity because of formation of a large number of aggregates. We suggest that the aggregation of Au-chem may be due to a partial loss of citrate anions that is impossible for Au-PLAL due to the negative charge localization on the Au-PLAL surface [1]. Furthermore, we will describe an easy and reliable method for the production of patterned monolayers of Au-PLAL NPs by using lithographic techniques.

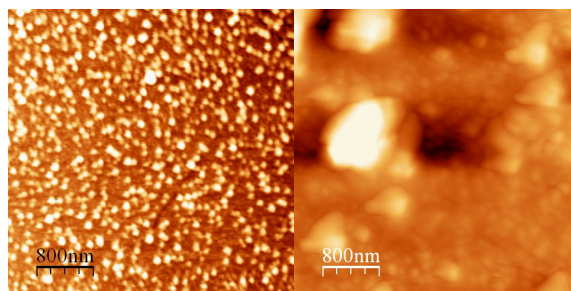


Fig.1. AFM images of self-assembled monolayers of Au-PLAL (left) and Au-chem (right). The scale corresponds to 800 nm.

References

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