Effect of organic stabilizers over silver nanoparticles fabricated by femtosecond pulsed laser ablation

Pablo Díaz-Núñez,[1,2] Jesús González-Izquierdo,[2] Guillermo González-Rubio,[2,3] Andrés Guerrero-Martínez,[2] Antonio Rivera,[1] José Manuel Perlado,[1] Luis Bañares[2] and Ovidio Peña-Rodríguez,[1,*]

[1]*Instituto de Fusión Nuclear, Universidad Politécnica de Madrid, José Gutiérrez Abascal 2, E-28006 Madrid, Spain*

[2]*Departamento de Química Física I, Facultad de Ciencias Químicas, Universidad Complutense de Madrid, 28040 Madrid, Spain*

[3]*BioNanoPlasmonics Laboratory, CIC biomaGUNE, Paseo de Miramón 182, 20009 Donostia - San Sebastián, Spain*

*ovidio.pena@upm.es

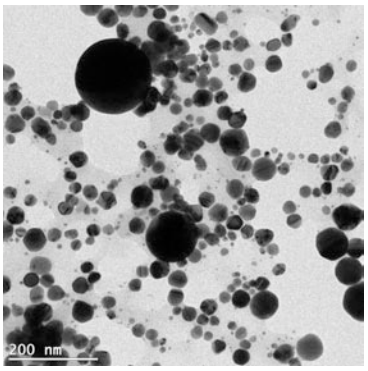
Abstract

Femtosecond Pulsed Laser Ablation (fs-PLA) is a versatile technique used in diverse applications. When applied in a liquid environment, this process is able to synthesize colloidal solutions of nanoparticles from the ablated material in a complex process [1]. Silver nanoparticle fabricated by femtosecond laser ablation was first reported in [2], where very low concentrated solutions were produced. In this work we have used femtosecond laser ablation to generate highly concentrated silver colloidal nanoparticle solutions. When performed in pure water, such concentrations usually lead to a high level of agglomeration making the solutions nearly useless. To avoid this problem, we have employed two different organic stabilizers, the ionic surfactant hexadecyltrimethylammonium bromide (CTAB) and the anionic polymer polyvinylpyrrolidone (PVP), and studied its effect on the size distribution, structural characteristics and concentration of the solutions by means of Transmission Electron Microscopy and optical absorption spectra. Our results show that the agglomeration can be considerably reduced or even completely eliminated with those stabilizers.

References

[1] V. Amendola and M. Meneghetti, Physical Chemistry Chemical Physics, 15(9) (2013) 3027-3046
[2] T. Tsuji, T. Kakita amd M. Tsuji. Applied Surface Science, 206 (2013) 314-320

Figures



TEM micrograph of silver nanoparticles fabricated by pulsed laser ablation in H_2O+PVP