

155 In-situ Silver Nanoparticles Formation Embedded into a Photopolymerized Hydrogel with Biocide Properties.

C.M. Gonzalez-Henriquez^{1*}, G. del C. Pizarro¹, O. Lopez-Carriall¹ and M.A. Sarabia-Vallejos².

¹Chemistry Department, Metropolitan Technological University, Santiago, Chile,

²Physics Institute, Pontifical Catholic University of Chile, Santiago, Chile.

email address corresponding author: carmenmabel@gmail.com

Nanosized inorganic particles display unique physical and chemical properties and also represent an increasingly important field in the nanodevices development. Nanoparticles could be used in numerous biomedical, catalytical, optical, electronic and quantum-size domain applications [1-2]. In particular, silver nanoparticles has recently used as antimicrobial agent for some Gram-negative bacteria [3]

This research was focused in the formation of *in-situ* nanoparticles embedded into hydrogel matrix. Thus, the polymer acts as a nanoparticles stabilizer preventing the metal oxidation. As source of silver nanoparticles were used AgNO₃ (0.75 and 1.0 M), which is mixed with (Hydroxyethyl) methacrylate (HEMA), Diethylene Glycol Dimethacrylate (DEGDMA-cross-linking agent) and a photoinitiator (Irgacure 651). The ratio HEMA/DEGDMA was manipulated with the finality to study possible changes in their physical and chemical properties.

Finally, antimicrobial studies were carried out on the samples, showing an interesting antimicrobial behaviour related with the ratio between HEMA and DEGDMA in the solution mixture. All the systems were studied by FT-IR, Raman, optical studies (UV/Vis absorption), thermal studies (DSC and TGA), X-ray diffraction, EDX-XRF and TEM (Fig. 1). With these techniques is possible to detect the presence of non-agglomerated silver nanoparticles homogeneously distributed in all the system. Particularly, quantitative assays show that the sample Ag_Hg3-89.5% (1.0 M) present an important biocide property, by reducing 99.9 % of bacterium *Escherichia coli* ATCC25922 as compared to the alone hydrogel.

The authors acknowledge the financial support given by FONDECYT Grant N° 11121281 and 1110836, also to the advanced human capital insertion program, PAI 7912010031-CONICYT, and finally to DAAD for the ellipsometer donation. Mr. Sarabia acknowledges the financial support given by CONICYT through the Magister Scholarship Grant.

References

- [1] H. Otsuka, Y. Nagasaki, K. Kataoka, *Adv. Drug Deliver. Rev.*, **64**, 246 (2012).
- [2] R. Hao, R. Xing, Z. Xu, Y. Hou, S. Gao, S. Sun, *Adv. Mater.*, **22**(25), 2729 (2010).
- [3] V. C. Verma, R.N. Kharwar, A.C. Gange, *Nanomedicine-UK*, **5**(1), 33 (2010).

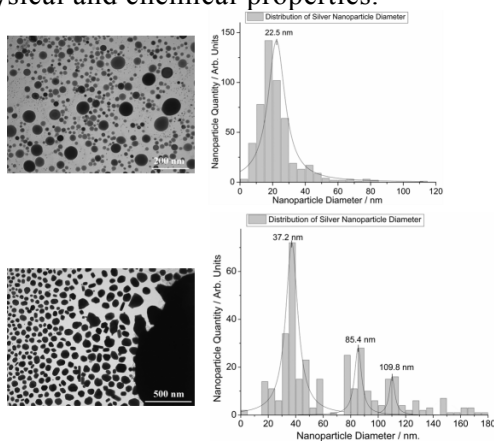


Fig. 1 TEM micrograph of the composites Ag_Hg3-89.5 % (0.75 M) and its respective histogram.