Polymer-based nanocomposite materials, catalytic and photocatalytic applications

Angel Leiva[1]
Oscar Ramirez[1], Alexander Córdoba[1], Cesar Saldias[1], Marcela Urzúa[2].

[1]*Pontificia Universidad Católica de Chile, Vicuña Mackenna 4860 Macul, Santiago, Chile.*
[2]*Departamento de Química, Facultad de Ciencias, Universidad de Chile, Santiago, Chile*

aleivac@uc.cl

Abstract
Hybrid nanocomposites based on polymers containing catalytic and photocatalytic nanoparticles in different formats have been obtained. Herein, three examples corresponding to, powder, thin films and nanofibers, are included.
Chitosan-based nanocomposite materials containing different amounts of gold nanoparticles were prepared as powder and thin films. The powder was obtained in solid phase by a thermal process, while the thin films were obtained by a wet chemistry method (Fig.1). In both cases, the materials were tested as catalysts in the reaction the reduction of 4-nitrophenol (4NP) to 4-aminophenol (4AP) as model reaction.
Additionally, nanofibers of chitosan and polycaprolactone mixtures (C-PCL), containing photocatalytic TiO_2 nanoparticles (Fig. 2), were obtained and tested in the photochemical decomposition of rhodamine B in water. The hybrid materials were designed and produced taking advantage of the special characteristics of chitosan biopolymer and the biodegradable poly ester PCL.

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References

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Figures

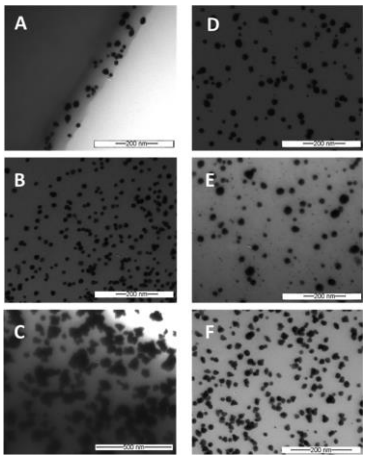

Figure 1: A- TEM images of gold-chitosan nanocomposite films obtained from immersion into different KAuCl4 solutions. (a, d) 5%, (b, e) 10%, and (c, f) 20% of $KAuCl_4$ and reduced with hydrazine (left side) and L-ascorbic acid (right side).

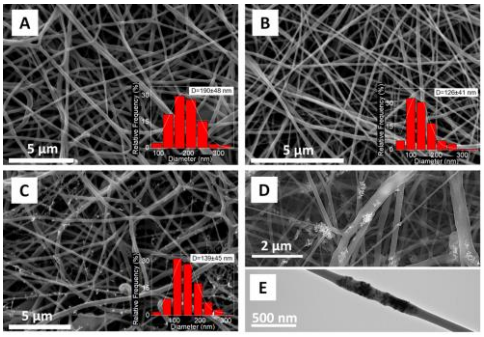

Figure 2: SEM micrographs of electrospun mats. A) PCL, B) PCL-CS, C) PCL-CS-TiO_2TX. Insets show the corresponding fiber diameter distribution. (D) SEM Imagen of PCL-CS-TiO_2TX mat without being coated in gold. (E) Imagen TEM of a single fiber of PCL-CS-TiO2TX.