MS38-P3 Design of polymer-silver nanocomposites for biomedical applications

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In the last decades, polymeric materials have attracted a significant interest in the biomedical field especially in their use as implants. With the emergence of new multi-drug resistant bacteria and despite the advanced sterilization procedures, the contamination of implant surfaces by bacteria is a new challenge to overcome.[1] Then, the design of new antibacterial/bactericidal surfaces in order to prevent bacterial adhesion and biofilm formation is an important task.

Silver has already been proven to be effective against bacterial infections even at low concentration (0,1-10 ppm).[3] Furthermore, it has been demonstrated that nano-sized silver could be even more efficient due to a better interaction with bacteria and a more long-term activity compared to ionic silver.[4] For these reasons, silver nanoparticles (NPs) will be exploited in the framework of this project.

The poly(N-isopropylacrylamide) (PNiPAAm) is widely studied for biomedical applications especially in tissue engineering owing to its good biocompability and thermosensitivity with a lower critical solution temperature (LCST) close to 32°C. Practically, the polymer is readily soluble under this temperature but above, it becomes insoluble and precipitates out.[5] In the context of this work, the polymer was synthesized by RAFT polymerization in order to provide silver binding site. Several nanocomposites with different ratios of silver/polymer have been prepared. Different techniques have been used to study these materials such as transmission electron microscopy, dynamic light scattering, thermogravimetric analyses, inductively coupled plasma, x-ray photoelectron spectroscopy.

[1]L. Guo, W. Yuan, Z. Lu, C. Li, *Colloids and Surface A : Physiochem. Eng. Aspects*, **2013**, 439, 69-83.

[2]J. Hasan, R. J. Crawford, E. P. Ivanova, *Trends in Biotechnology*, **2013**, 31, 295-308.

[3]S. Silver, L. T. Phung, G. Silver, *J. Ind. Microbiol. Biotechnol.,* **2006**, 33, 627-634.

[4]J. R. Morones, J. L. Elechiguerra, A. Camacho, K. Holt, J.B. Kouri, J.T. Ramirez, M.J. Yacaman., *Nanotechnology*, **2005**, 16, 2346-53.

[5]B. Jeong, A. Gutowska, *TRENDS in Biotechnology*, **2002**, 20, 305-11

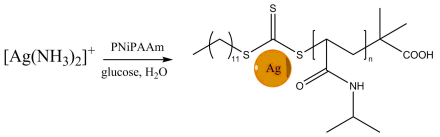

Figure 1. Synthesis of the nanocomposite

Keywords: Silver, nanoparticles, polymer

MS38-P4 Preparation and characterization of 2-(4H-1,2,4-Triazol-4-yl)phenol crystals by hydrothermal method

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Schiff-bases Triazoles compounds exhibits a wide variety of excellent bioactivities have particularly multifarious uses in agriculture, medicine, and industry [1]. Also, 1,2,4-triazoles are widely used ligands in coordination chemistry and they can be coordinated to a metal ion in different modes, bidentate-bridging or monodentate, depending on the position and the nature of the substituent at the triazole ring [2]. 2-(4H-1,2,4-triazol-4-yl)phenol was prepared by reacting the diformylhydrazine and o-aminophenol by hydrothermal method. The hydrothermal method is environmentally friendly since the reactions are carried out in a closed system and the contents can be recovered and reused after cooling down to room temperature [3]. The hydrothermal technique has been the most popular one, gathering interest from scientists and technologists of different disciplines, particularly in the last fifteen years. The crystal structure of 2-(4H-1,2,4-triazol-4-yl)phenol is monoclinic, space group $P\ 2_1/n$, with a = 7.274(3) Å, b = 14.254(4) Å, c = 7.722(3) Å, Z = 4, V= 800.5(5) Å^3. The crystal structure was solved by direct methods and refined by full-matrix least squares to final values of R_1 = 0.0475 and wR_2 = 0.1297 with 1328 reflections ($I > 2\sigma(I)$). This compound is involved in hydrogen bonding and acting as a donor with N atom. The orange crystals suitable for X-ray diffraction studies were obtained. Yield based on o-aminophenol was 62%. The crystal structure was solved by direct methods and refined by full-matrix least squares using the program SHELXTL-97 [4]. All of the H atoms were positioned geometrically and allowed to ride on their parent atoms. The 2-(4H-1,2,4-triazol-4-yl)phenol is involved in hydrogen bonding, acting as a donor with N atom. There is a π-π stacking interaction between the offset triazol rings (3.808(2) A°) and hydrogen of phenol ring to another ring (C-H…π) interaction; 2.768(2) A°. Thus, two factors, hydrogen bonding and π-π stacking may control the packing of this compound. Whether the π- π stacking between the off set triazol rings or C-H…π interaction helps to form the hydrogen bonding or whether the "hydrogen bonding" helps to form π- π stacking is not clear. However, the self-assembly of these compound is likely caused by both hydrogen bonding and the π–π stacking interactions.

Keywords: 2-(4H-1,2,4-Triazol-4-yl)phenol, Hydrothermal method, Schiff-bases compounds