(185i) Novel Polyoxometalate- Ionic Liquid with Antibacterial and Antifungal Properties. Feasibility of Its Implementation As a Multifunctional Thin Coating

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Authors:

Enderle, A. - Presenter, Universidad Nacional del Litoral
Streb, C., University of Ulm
Bollini, M., CIBION CONICET
Culzoni, M. J., Universidad Nacional del Litoral
Mitchell, S., Universidad de Zaragoza
Franco Castillo, I., Universidad de Zaragoza

The synthesis of hybrid materials, combining the properties of organic and inorganic components, results in composites with unique physical and chemical features. Polyoxometalates (POMs), i.e. inorganic anionic molecular metal oxides, are considered as promising future metallodrugs due to their antiviral, antitumoral and antibacterial activities. The combination of bulky organic cations with POMs results in composite ionic liquids (IL; melting point below 100°C) which combine the unique properties of both components. Pioneering studies have used composites of alkylammonium cations and POM anions for multifunctional water purification to remove toxic heavy materials, organic aromatics and microbes and for the inhibition of bio-corrosion on metal and stone surfaces due to coating formation.

In this work, the synthesis of a novel POM-IL and its incorporation in a nanostructure which can be used as a multifunctional thin antimicrobial coating for different surfaces will be shown. It could be a potential candidate to be used in health care environments because the spread of infections is a persistent and growing problem in most countries, and new alternatives are required to reduce microbial activity and associated infections.

The sterically demanding cation of the bio-based family of guanidine-alkyl-guanidinium cation (DOTMG), combined with the lacunary Keggin POM - Î±[$SiW_{11}O_{39}$]$^{-8}$ -, resulted in a non- cytotoxic material with further enhanced antimicrobial and antifungal properties. Experimental details for the synthesis,

pharmacokinetic properties, cytotoxicity, antimicrobial and antifungal studies will be described. Moreover, the feasibility of its implementation in a matrix of PMMA will be presented together with a chemometric approach using statistical methods for selecting optimal parameters - Design of Experiments (DoE)- to enhance the biofilm inhibition and the impact of topography on surface effectiveness. The polymeric coating results to be biocompatible and easy to manipulate. It would fulfill the requirements of low toxicity and chemical safety of the safe-by-design criteria, an important aspect in clinical settings.

The POM based ILs have proven to be useful to prepare new types of multifunctional coatings for different surfaces. The results endorse the great potential and future directions of these advanced materials in the development and implementation of antimicrobial surfaces.

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