

Antimicrobial films containing green synthesised zinc oxide nanoparticles for biomedical applications

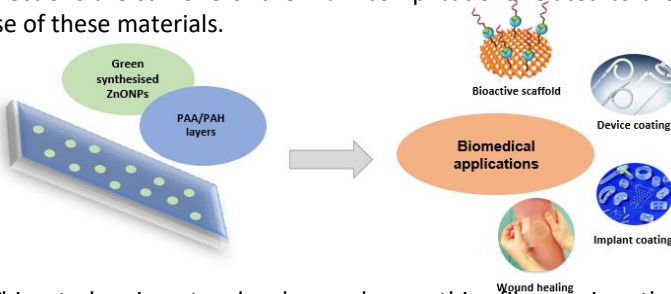
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Introduction

Synthetic biomaterials have been vastly investigated for different biomedical applications such as wound healing adhesives¹, implant devices² and drug delivery systems³. The effort on this field of study promoted the development of novel medical treatments and therapies leading to a significantly enhancement on people's health and life expectancy⁴. However, infections are still one of the main complications related to the use of these materials.



This study aims to develop polymer thin films using the polyelectrolytes PAA (poly acrylic acid) and PAH (poly allylamine hydrochloride) with incorporated zinc oxide nanoparticles obtained *via* green synthesis and *Ilex paraguariensis* (IP) extract as a potential antimicrobial coating for biomedical applications

Methods

Thin films – Layer-by-layer method



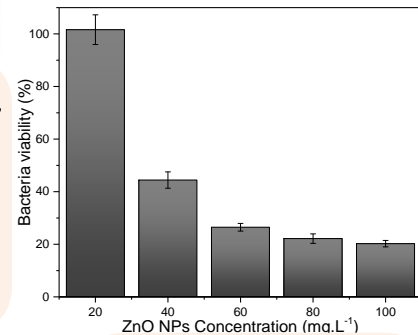
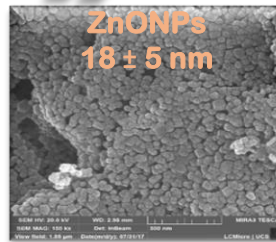
DOE: 2³ with central point

| Factors | -1 | 0 | +1 |
|------------|-----|-----|-----|
| PAH pH | 5.5 | 7.0 | 8.5 |
| ZnONPs g/L | 1 | 2 | 3 |
| IP g/L | 0 | 25 | 50 |

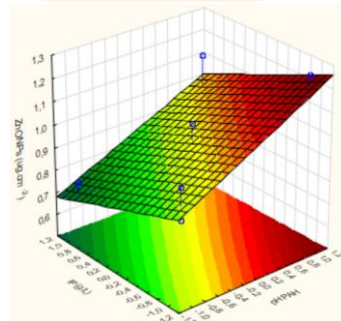
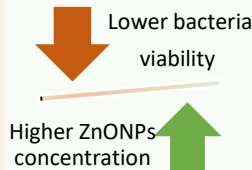
Results and discussion

ZnONPs - Particle size

Samples obtained by green synthesis using IP extract showed spherical morphology with an average size of 18 nm.



ZnONPs – Antimicrobial activity



Thin films – ZnO content

A pH solution of 8.5 and no plant extract provided the highest ZnONPs content (1.25 µg.cm⁻²). Absorption of ZnONPs in the films was not affected significantly by the concentration of ZnONPs in solution, according to the statistical analysis.

Conclusion

ZnONPs with antibacterial properties were obtained *via* green synthesis. The incorporation of ZnONPs in the films was optimized, where higher pH solution and lower IP concentration improved the absorption of ZnO into the films. Further studies on the antibacterial property, cytotoxicity and morphology are under development to evaluate the potential of the films to be used as antimicrobial coating for biomedical applications.

References

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