Industry Day Theme # {Emerging Nano and Advanced Materials}

Exceptionally high antimicrobial activity demonstrated by porous microparticles made by biodegradable polymer

Agni Kumar Biswal and Sampa Saha*

*E-mail: ssaha@polymers.iitd.ac.in

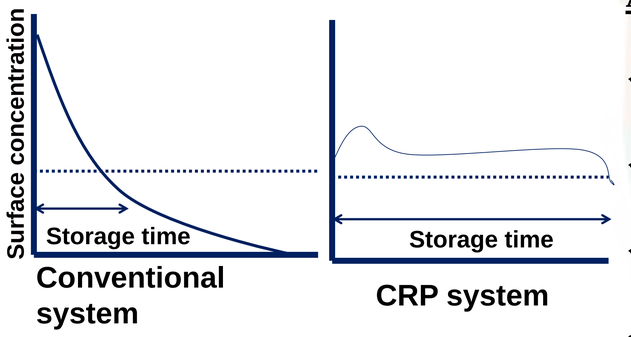
Department of Materials Science and Engineering, IIT Delhi

Abstract

This investigation mostly involves fabrication of biodegradable porous PLGA microparticle encapsulated with dual actives mustard oil and benzoic acid using solvent evaporation technique. The porous as well solid PLGA microparticles were fabricated for comparison study. The morphology and compositional analyses were done using SEM and Raman analysis. The in vitro release of active benzoic acid were done in PBS (pH 7) at 37 °C and 200rpm. The antimicrobial activity of loaded actives particles were treated against microbes (*Escherichia coli*) and the assay shows the complete inhibition effect which indicates the system can be used as preservative materials to enhance the shelf- life of food.

Introduction

Controlled release packaging technique(CRP)



Advantages

- ✓Non-toxic
- ✓No extra preservatives
- ✓Controlled release
- ✓Increase shelf-life of food

Mechanism and formation of porous microparticles

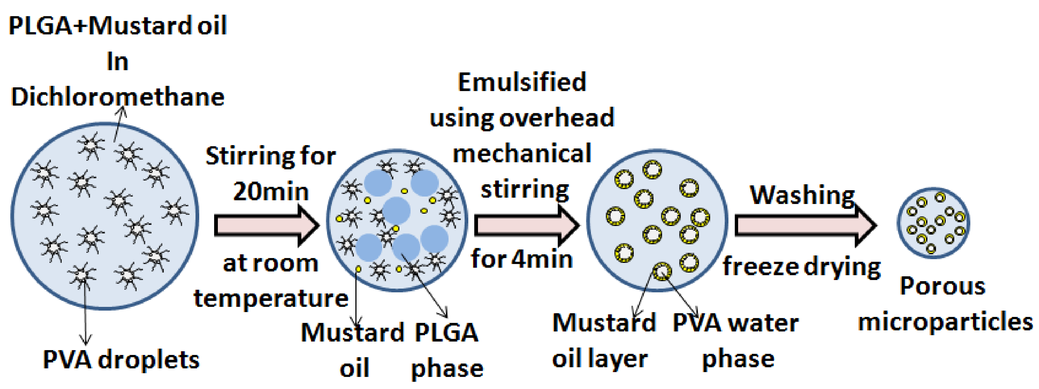


Figure 1

Conclusion

- The PLGA microparticles with porous surface were successfully fabricated sing solvent evaporation technique.
- *In vitro* release study shows the PLGA microparticles can be used as controlled drug delivery system.
- The complete inhibition of bacterial growth continue till 60days and hence porous microparticles can be used as good drug delivery system as well as the preservative material.
- The real food application of porous microparticles into watermelon juice which indicates its good preservative properties.

Industrial Significance

Potential applications of these porous microparticles include drug delivery and food packaging.

Technology Readiness Level:

Optimization for fabrication of porous particles in large scale needs to be carried out.

Results and discussion

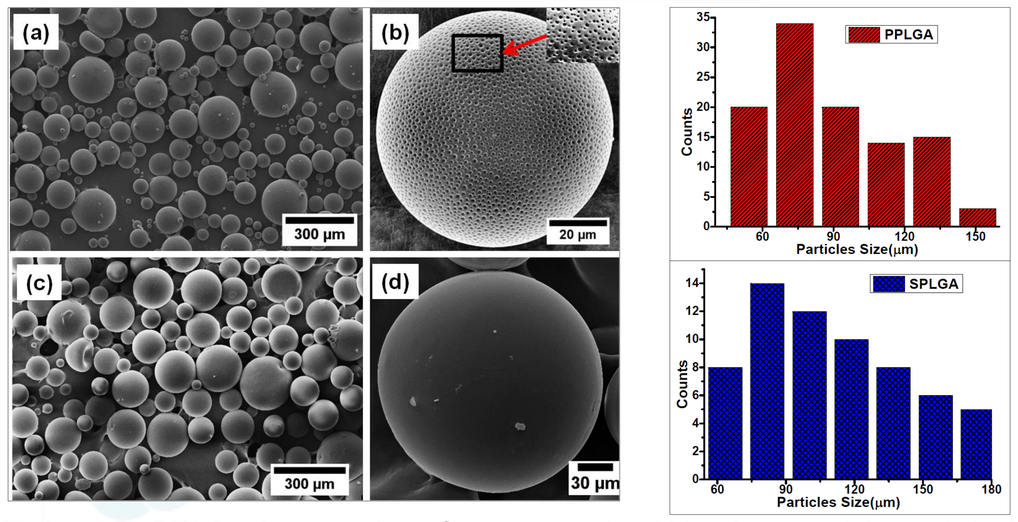


Figure 2. SEM micrographs of porous and solid microparticle and their particle size distribution.

Table 1

Name	Particle size (micron)	Encapsulation efficiency(%)
SPLGA	82±40	48
PPLGA	73±36	49

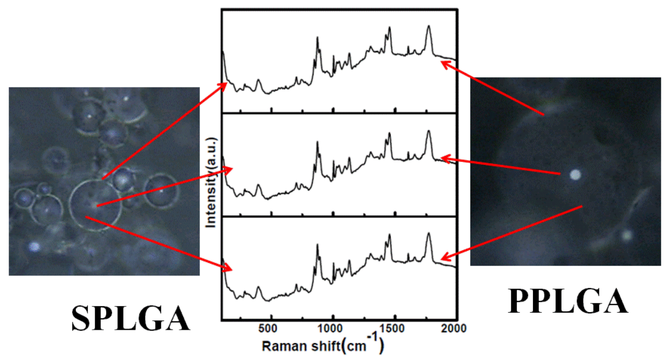


Figure 3. Raman analysis of microparticles.

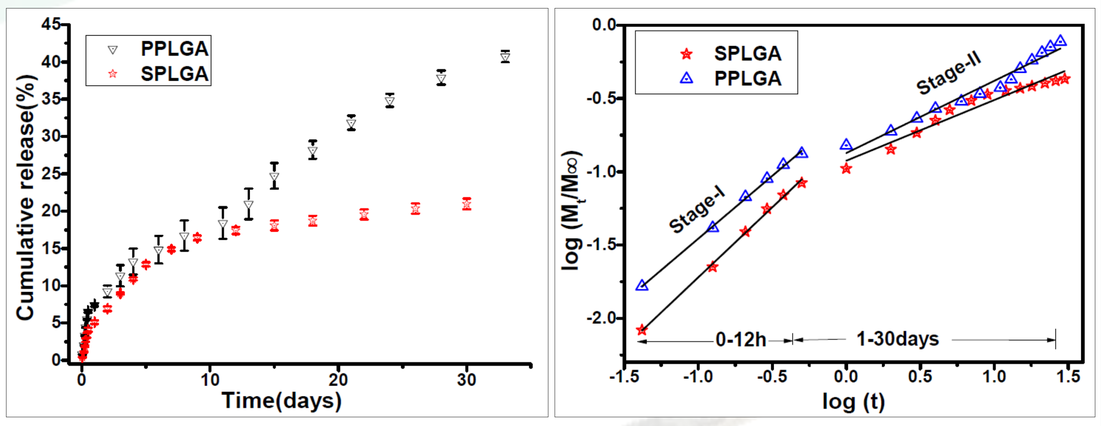


Figure 4. *In vitro* release of active and diffusion behaviour of actives.

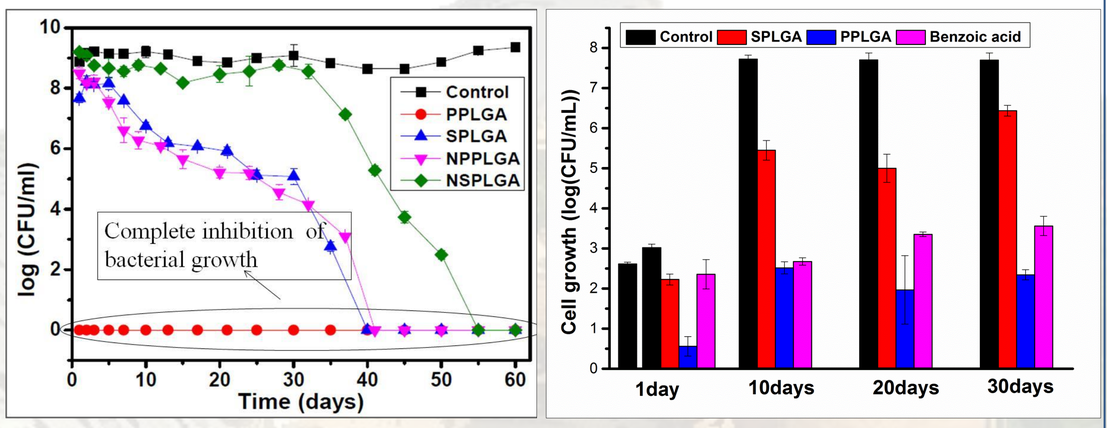


Figure 5. Antimicrobial assay and real food application of microparticles.

References

1. **Agni K Biswal** *et al*. *Indian Patent* **2017,** Application no.201711035034.

2. Mastromatteo *et al*. *Trends Food Sci. Technol.* **2010,** 21 (12), 591-598.

3. Ravichandran M. *et al. J. Food Safety* **2011**. 31(4): p. 462-471.

Acknowledgement

Department of Materials Science and Engineering, Indian Institute of Technology Delhi, New Delhi