

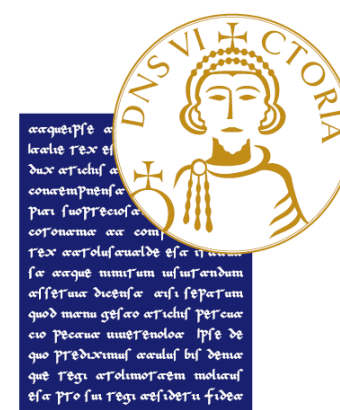
# Enhanced P3HB-Chitosan Blends: Synthesis, Processing, and Biocompatibility for Biomedical Applications

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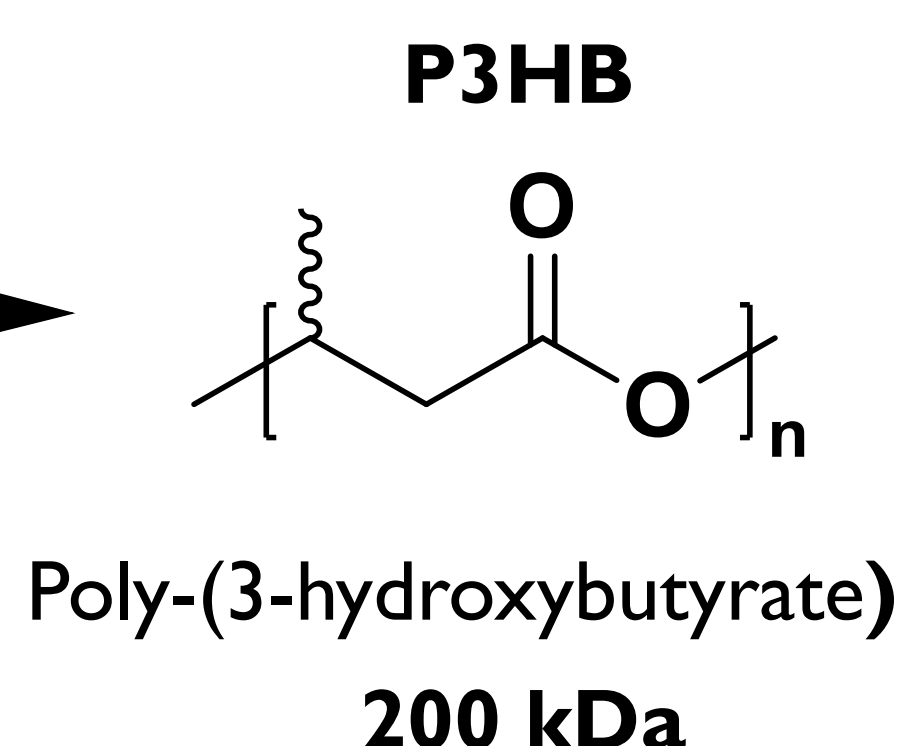
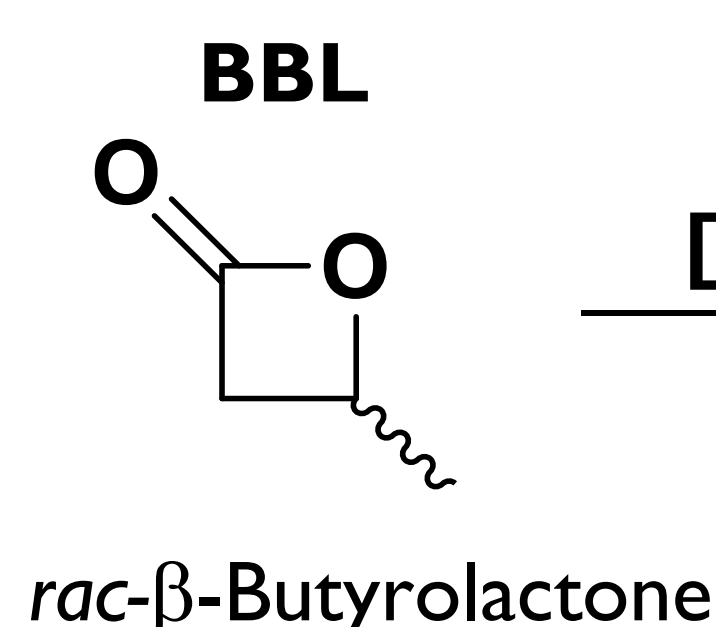
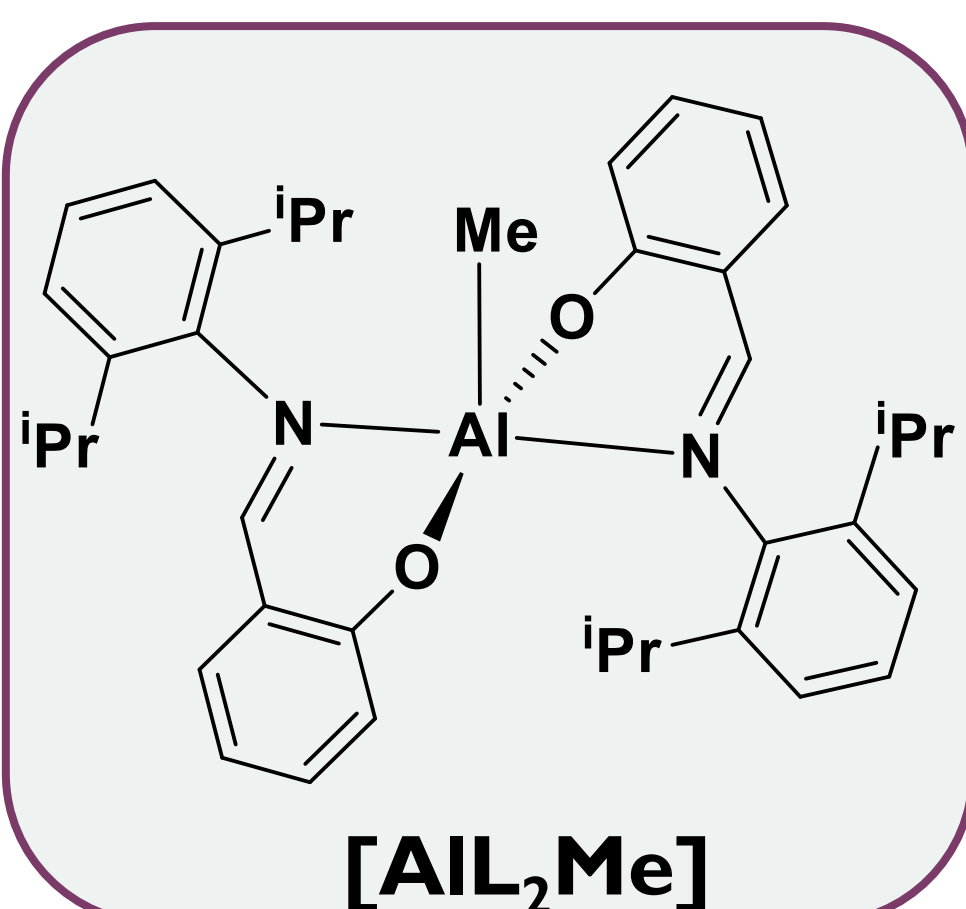
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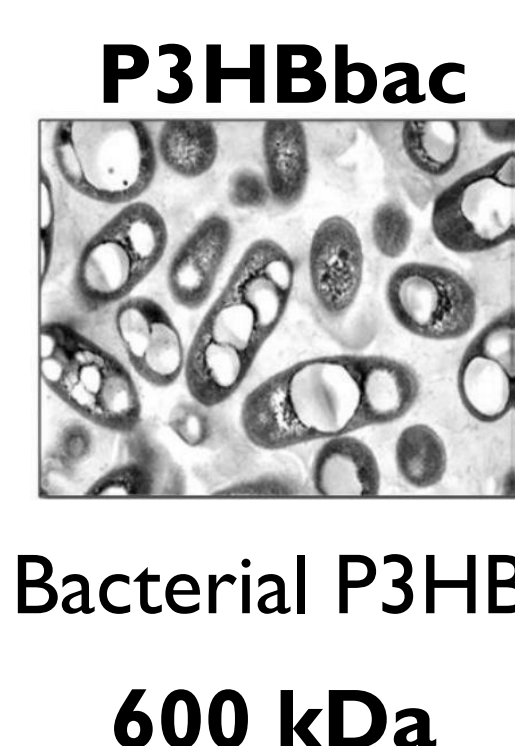


Poly(3-hydroxybutyrate) (P3HB) is an isotactic thermoplastic polyester produced by bacteria, showing properties similar to PP and PET. However, its high production cost limits its use.<sup>1</sup> To address this issue, we have developed P3HB blends incorporating a synthetic high-molecular-weight P3HB, obtained via ring-opening polymerization (ROP) of *rac*- $\beta$ -butyrolactone (BBL) using an aluminium catalyst previously reported by our group.<sup>2</sup> The aim was to improve blend homogeneity and tailor material properties. Additionally, chitosan was added in varying amounts to selected blends to provide antioxidant and antimicrobial functionalities without altering physical performance.

## Ring-Opening Polymerization



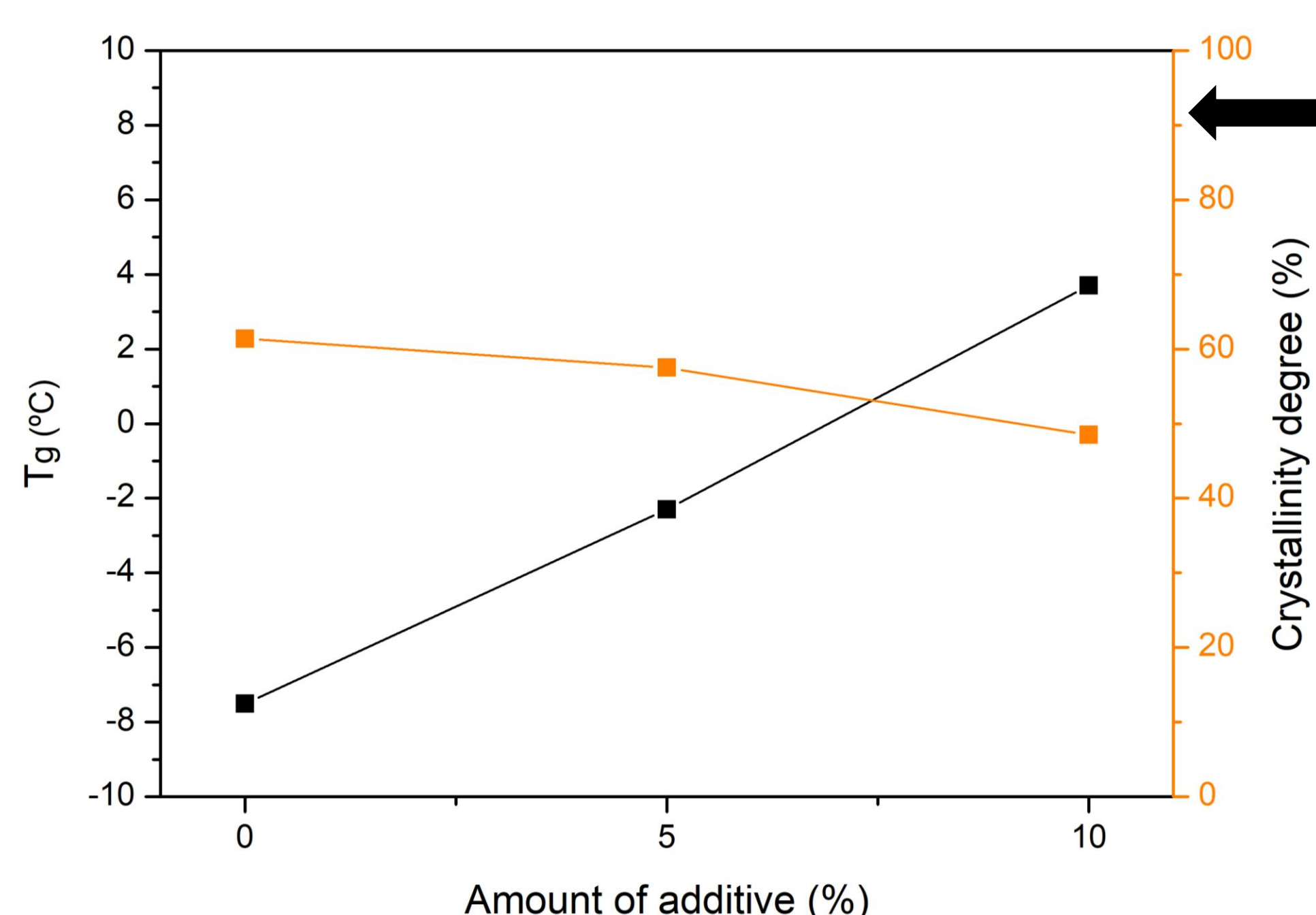
## Use as Additive



P3HB5%

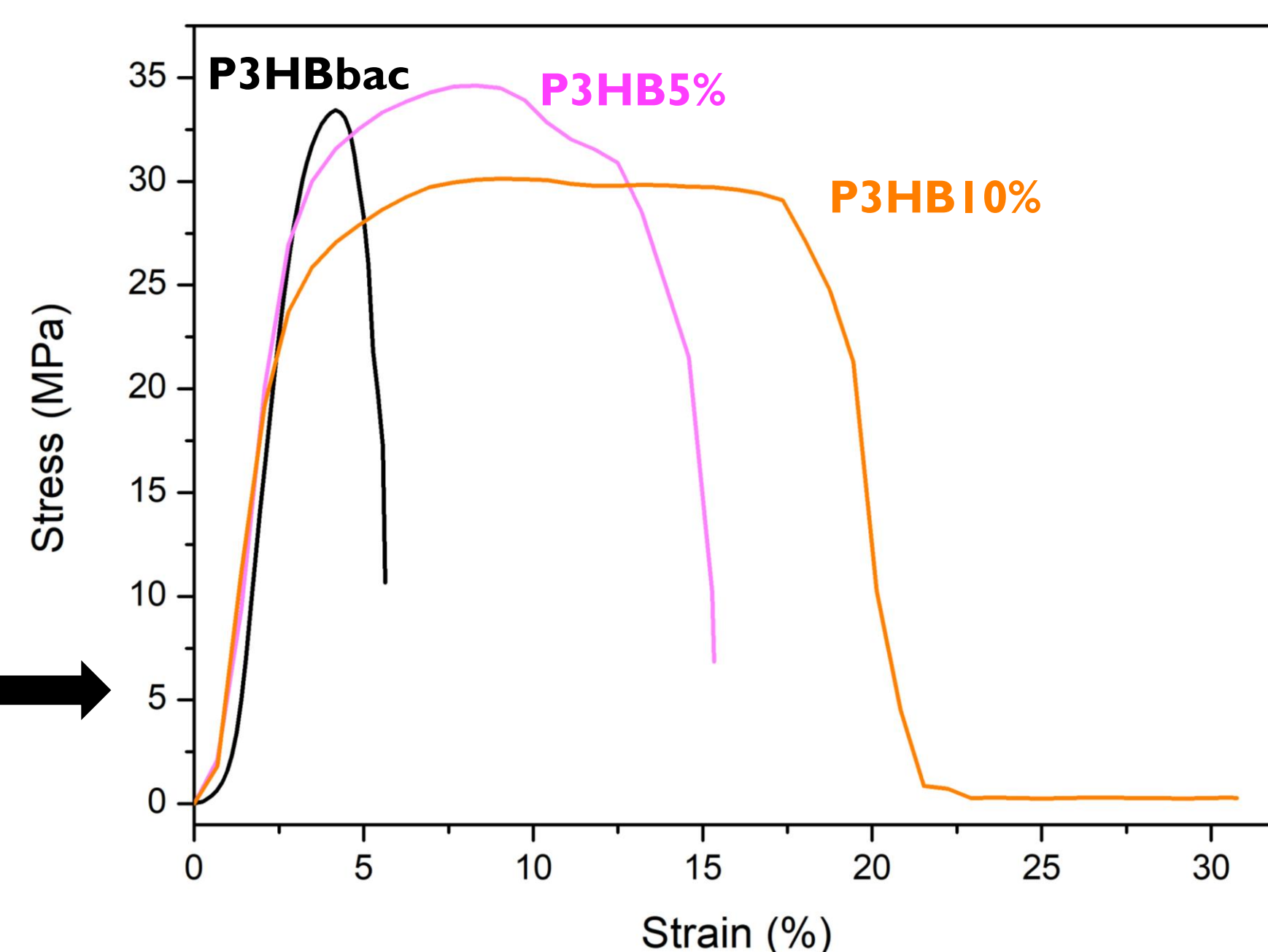
P3HB10%

## Thermal and Mechanical Characterization



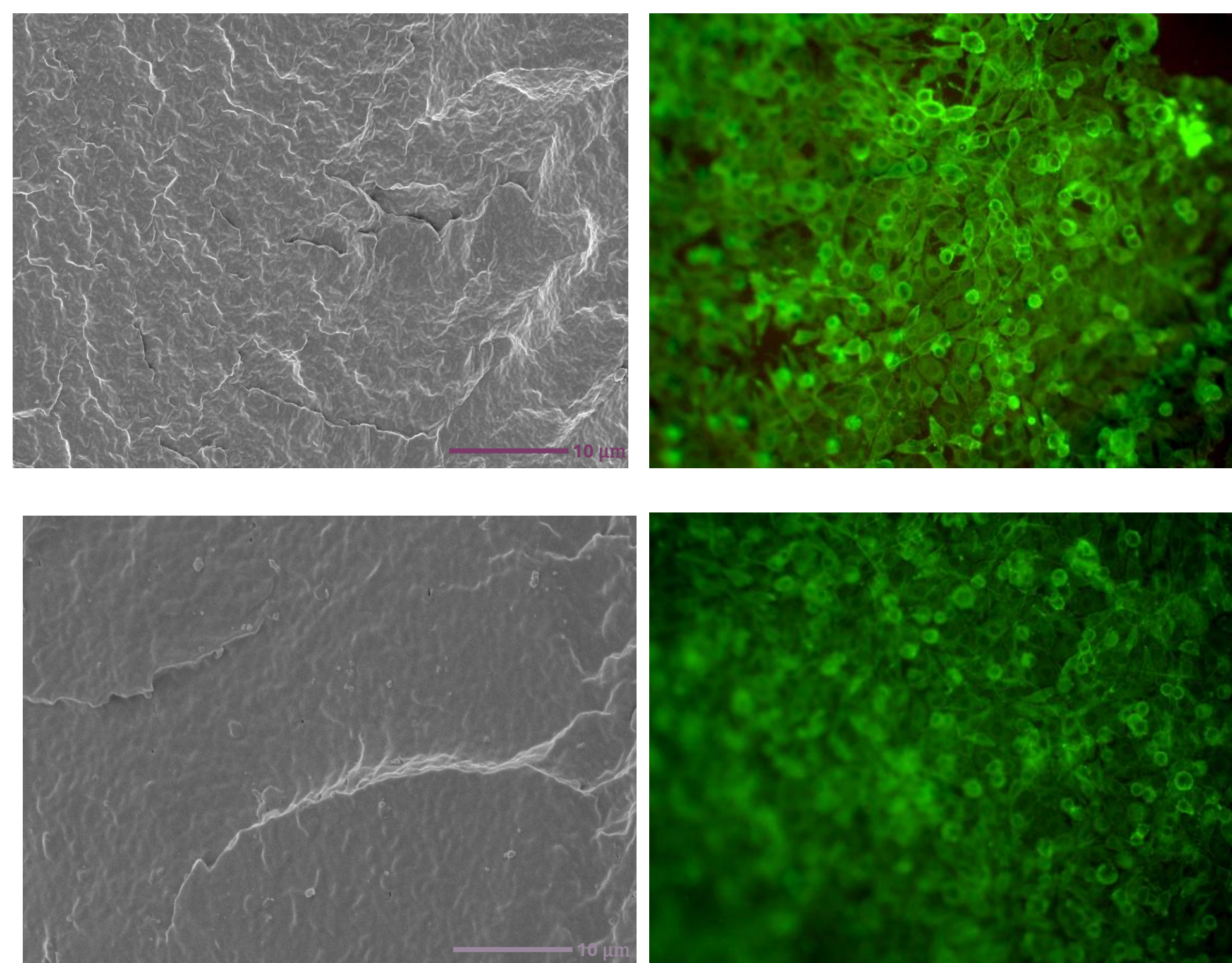
The additive leads to a reduction in crystallinity, favourable for flexibility and processing. Also, it modifies T<sub>g</sub> suggesting a strong interaction between both components.

The additive reduce the brittleness and increase the flexibility of the material reaching higher elongation at break values.

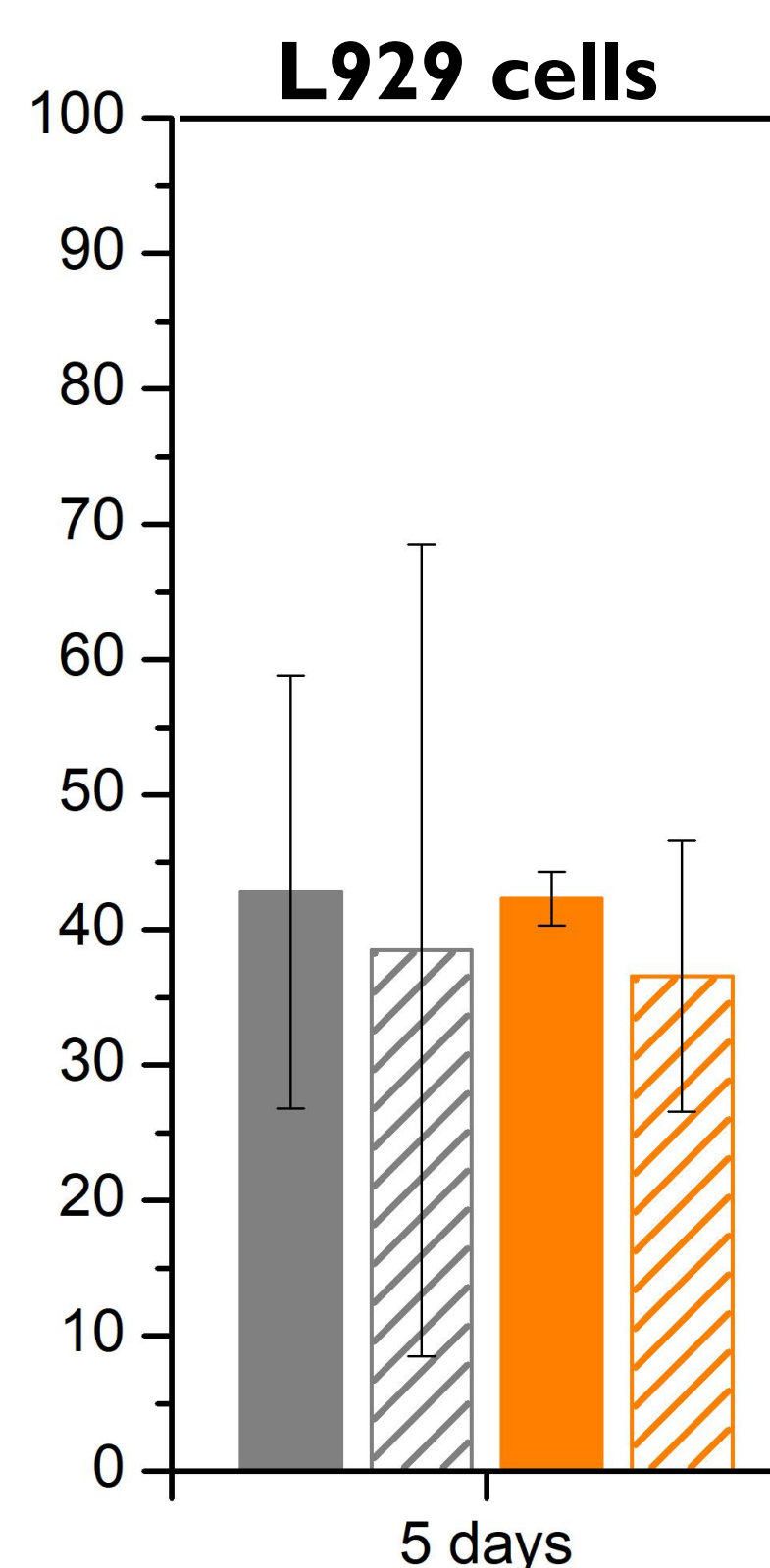
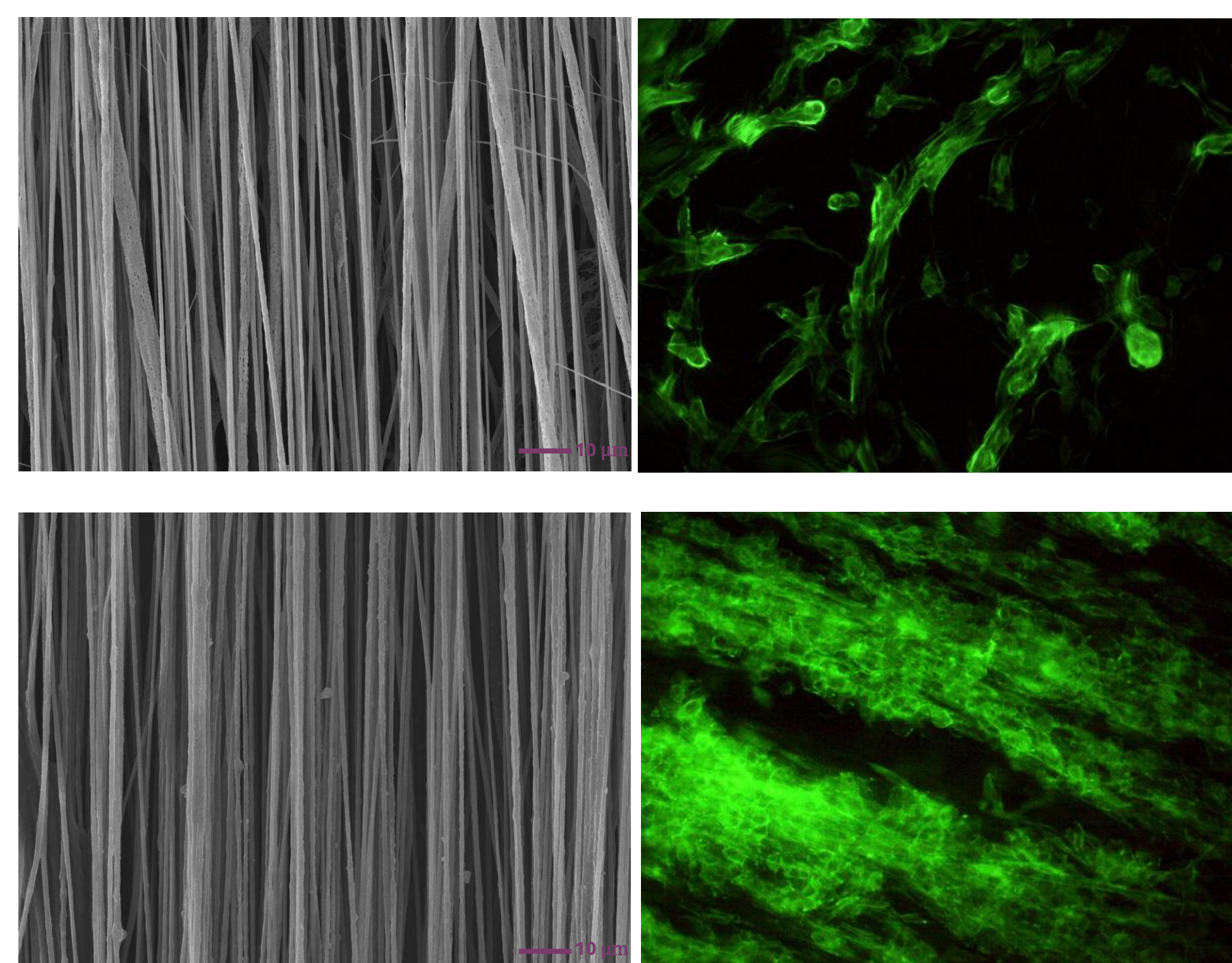


## Influence of Processing on Morphology and Cell Response

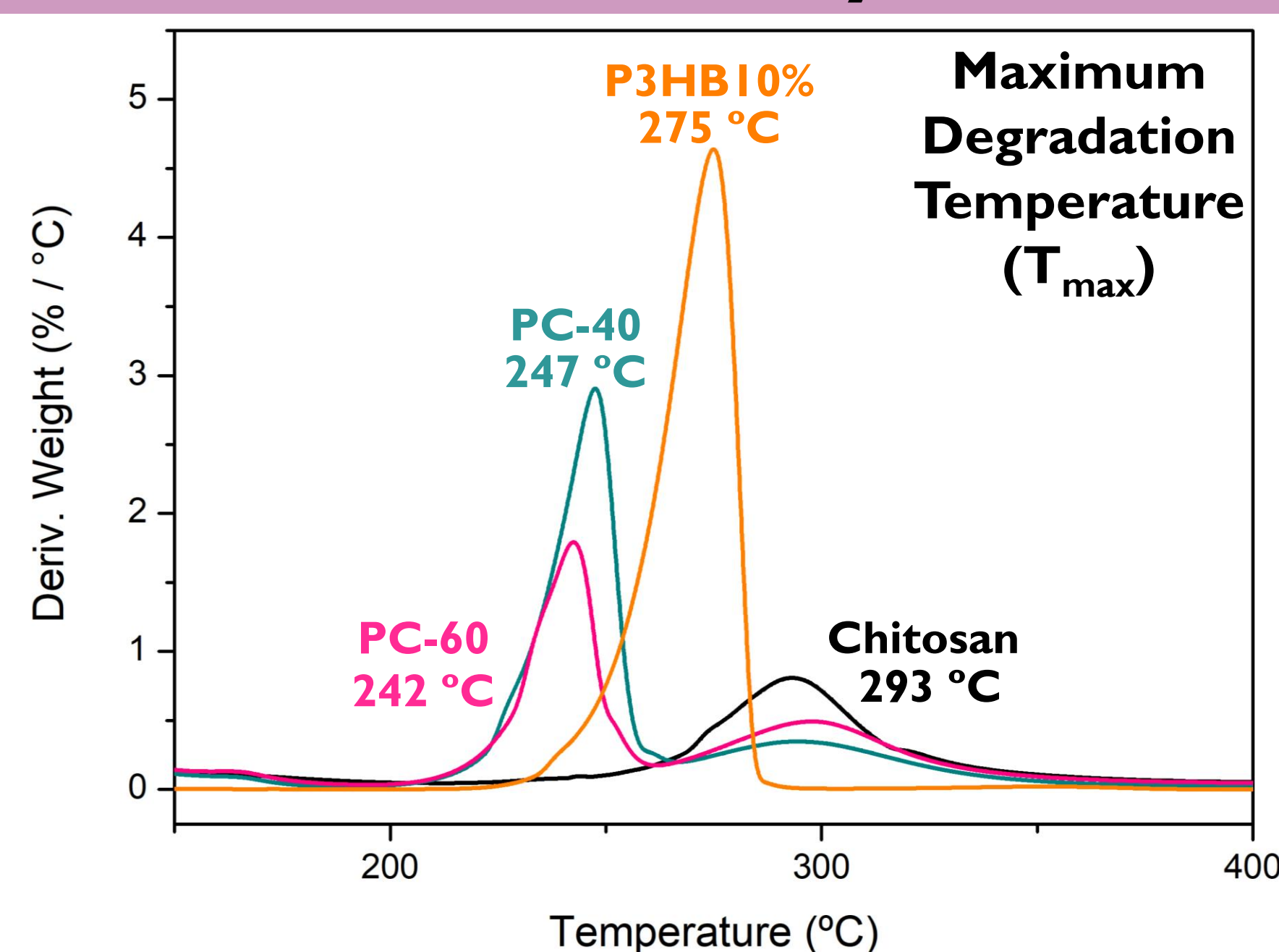
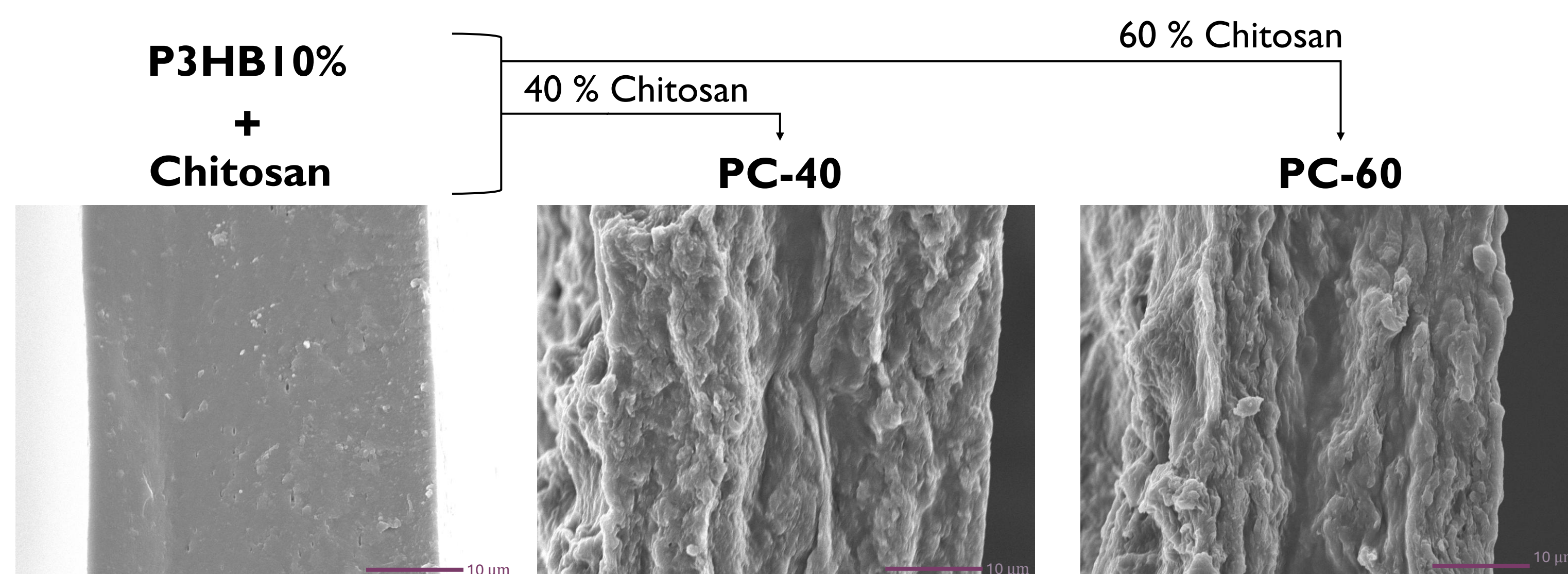
### Solvent Casting



### Electrospinning



## Effect of Chitosan Content on the Morphology and Thermal Stability



## Conclusions

- SEM studies confirmed **good miscibility**, with the absence of any phase separation
- Cell viability studies showed similar results, but cell morphology varied between the processing methods
- The addition of chitosan led to **less homogeneous materials** resulting in a **decrease in the T<sub>max</sub>**

- The addition of 10 wt.% synthetic P3HB significantly improved the properties, **increasing elongation at break** by over 20%, and **decreasing its crystallinity**

### References

- C. Yogesh, B. Pathak and M. H. Fulekar, *Res J Environ Sci*, **2012**, 1, 46-52.
- F. M. García-Valle, M. E. G. Mosquera, et al, *Organometallics*, **2018**, 37, 837-840



### Acknowledgment

- Ministerio de Ciencia e Innovación (Spain) (PID2021-122708OB-C31)
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