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# EVALUATION OF BIOINSPIRED HAP/$TiO_2$ CERAMIC SCAFFOLDS PRODUCED BY COLLOIDAL PROCESSING FOR TRABECULAR BONE TISSUE REGENERATION

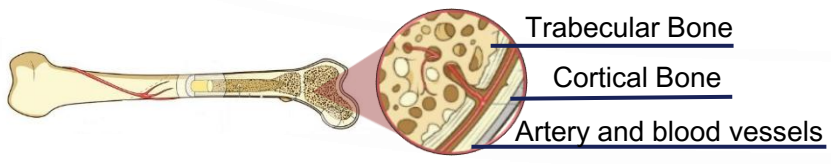
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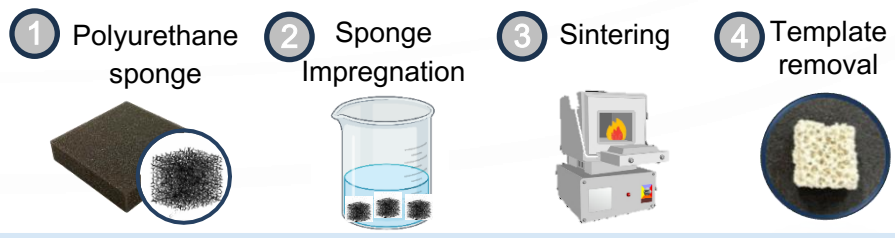
## INTRODUCTION

Natural hydroxyapatite (HAp) is a promising material for bone tissue engineering, but its brittleness limits the mechanical performance of highly porous scaffolds. This study evaluates how incorporating 30 wt.% $TiO_2$ affects suspension rheology, scaffold microstructure, total porosity, and compressive strength after replica processing.

Schematic representation of cortical and trabecular bone




Schematic representation of replica processing




## MATERIALS AND METHODS

### Compositions

- 100 wt.% natural HAp (reference)
- 70 wt.% HAp + 30 wt.% $TiO_2$

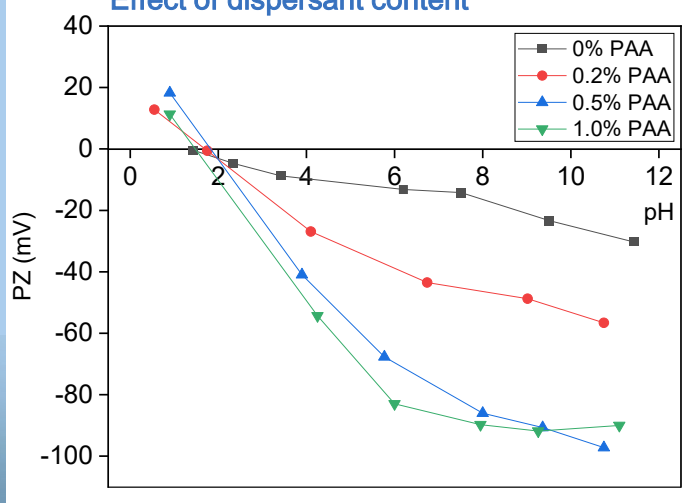
  Commercial anatase $TiO_2$; D50 ≈ 200 nm

### Optimized colloidal processing

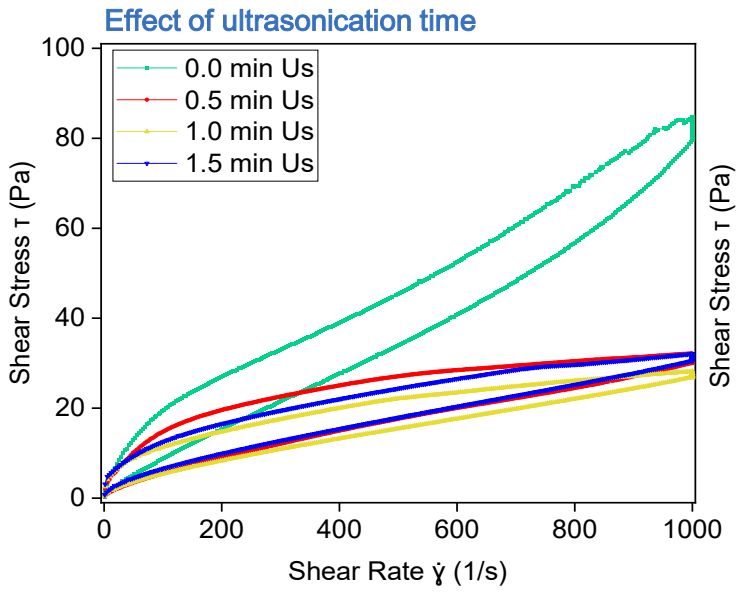



## RESULTS

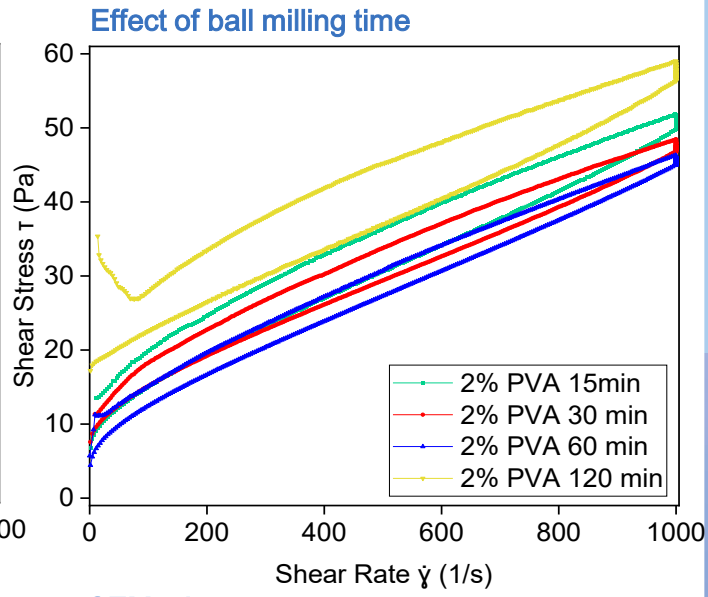
Effect of dispersant content



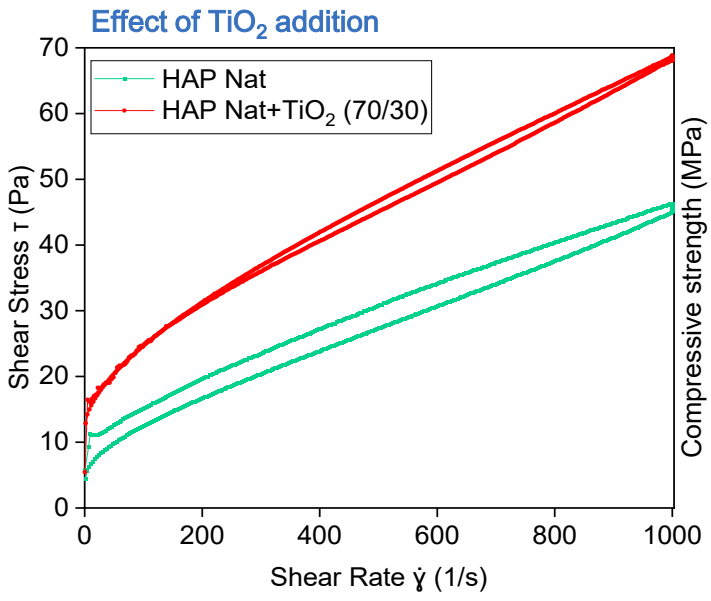

Effect of ultrasonication time



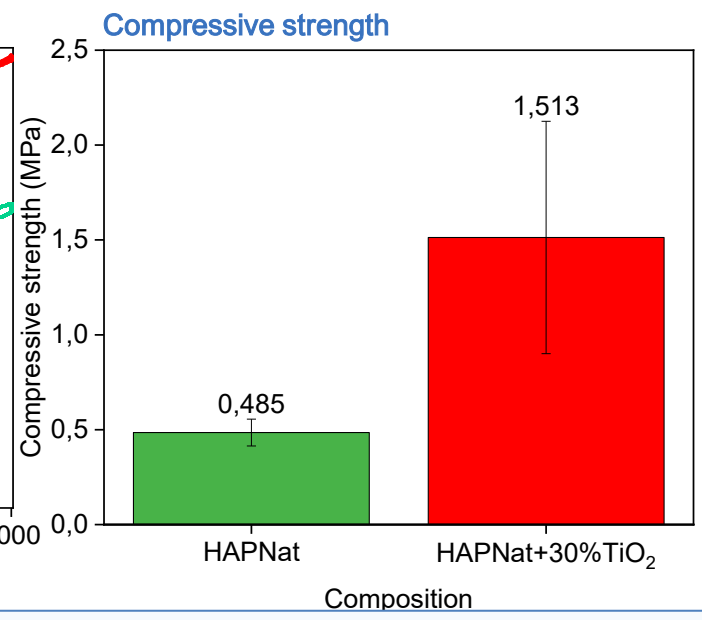

Effect of ball milling time



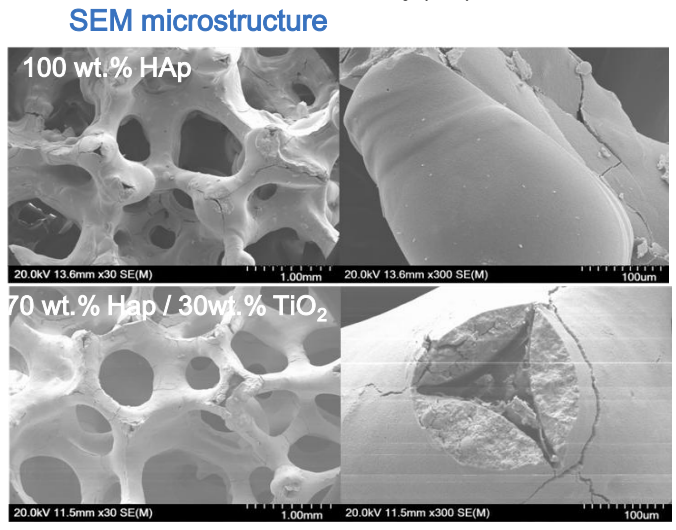

Effect of $TiO_2$ addition




Compressive strength




SEM microstructure




Compressive strength: 0.485 → 1.513 MPa (~3×)

Total porosity: 83.96 ± 0.75% → 72.79 ± 0.45%

## CONCLUSIONS

Optimized colloidal processing enabled the fabrication of highly porous scaffolds composed of 70 wt.% natural HAp and 30 wt.% $TiO_2$ using the replica method. $TiO_2$ incorporation increased the average compressive strength approximately threefold, while total porosity remained above 70%. Higher suspension viscosity and reduced porosity highlight the importance of balancing processing behavior and mechanical performance.

## REFERENCES

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## ACKNOWLEDGEMENTS

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