

Surface modification of n-HAp increases the compatibility with PLA scaffold composites.

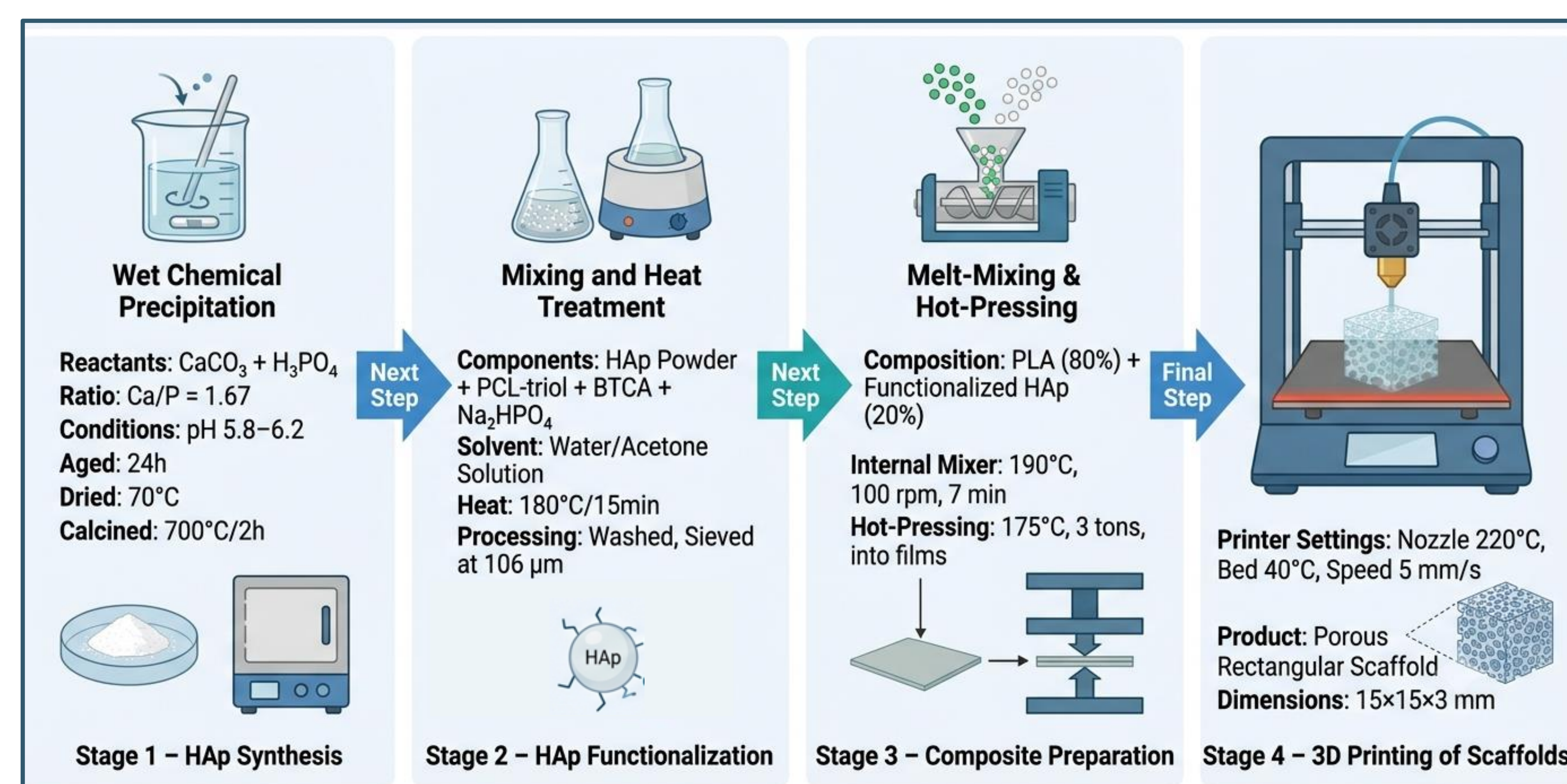
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INTRODUCTION & AIM

PLA/HAp scaffolds demonstrate structural composition and mechanical properties comparable to natural bone; however, the hydrophobic nature of PLA and the hydrophilic character of HAp create interfacial incompatibility that compromises composite integrity, limiting its application in Bone Tissue Engineering. To overcome this challenge, this study proposes the use of poly(caprolactone-triol) (PCL-triol) combined with 1,2,3,4-butanetetracarboxylic acid (BTCA) as a functionalizing agent for hydroxyapatite, aiming to promote ester bond formation between the hydroxyl groups on the HAp surface and PLA chains. Given the hydrolyzable nature of these ester bonds, the system is hypothesized to be susceptible to gradual degradation over time, enabling bioresorption of the composite and its progressive replacement by newly formed bone tissue.

METHOD



The schematic diagrams were created using NotebookLM and Gemini.

RESULTS & DISCUSSION

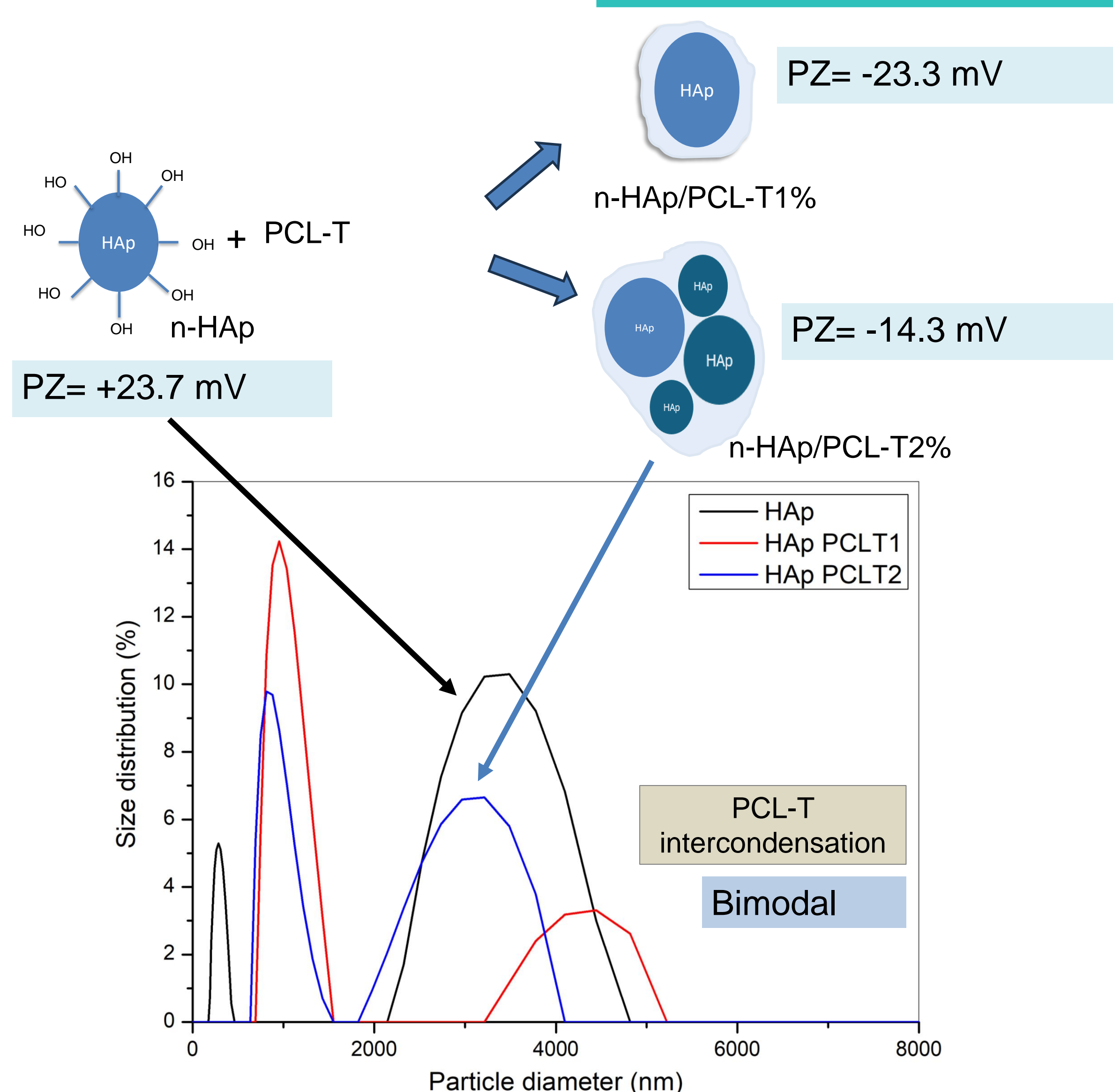
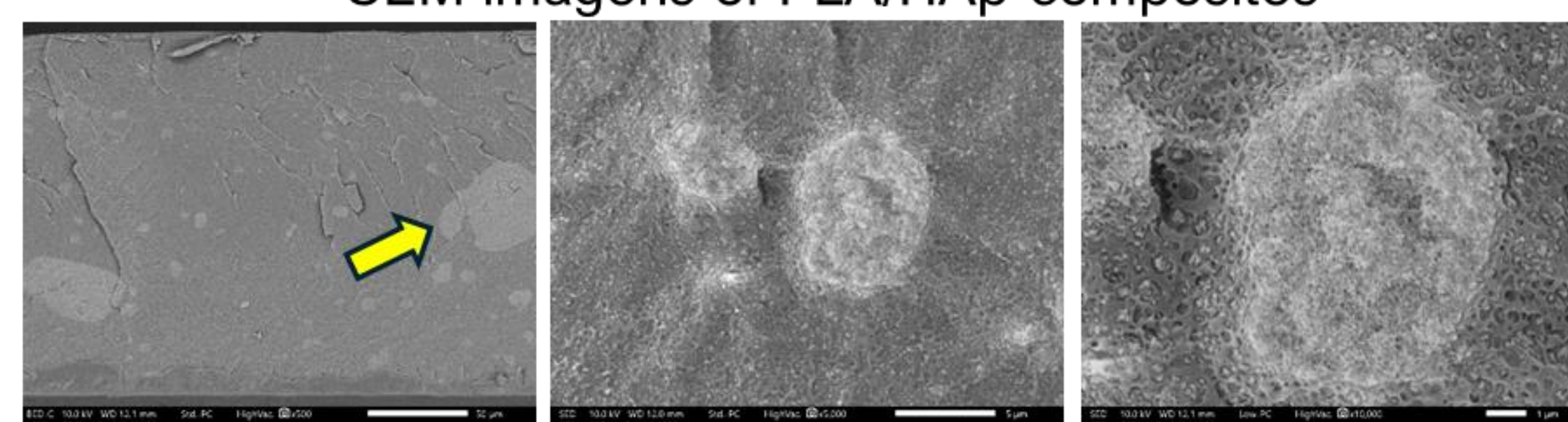


Fig. 1: Particle size distribution (DLS) suspended in ethanol.

SEM images of PLA/HAp composites



SEM images of PLA/HApPCLT1% composite

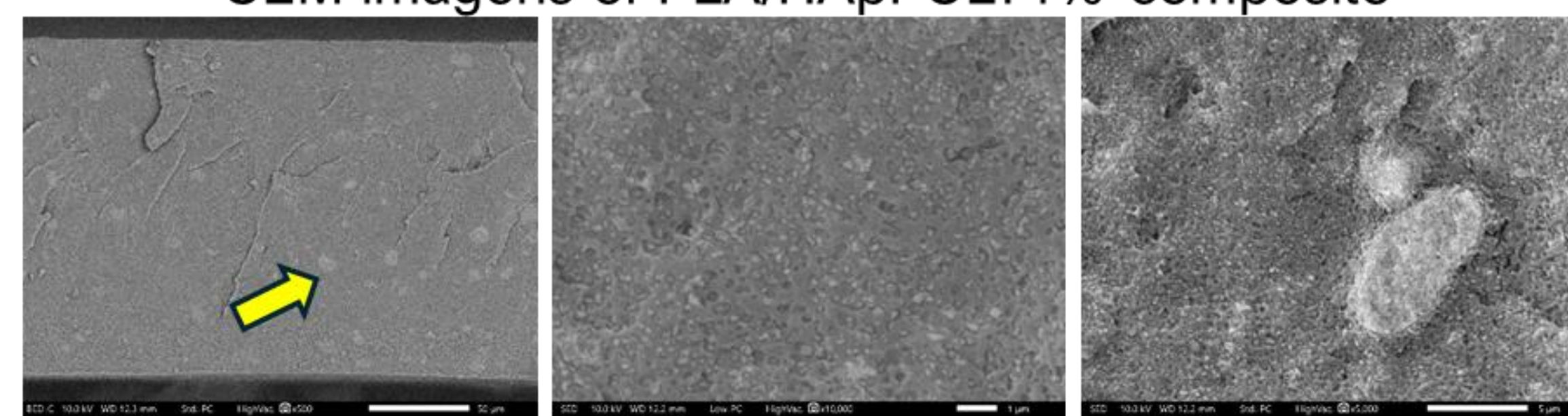


Fig. 2: SEM images of PLA/HAp and PLA/HApPCLT1% composites

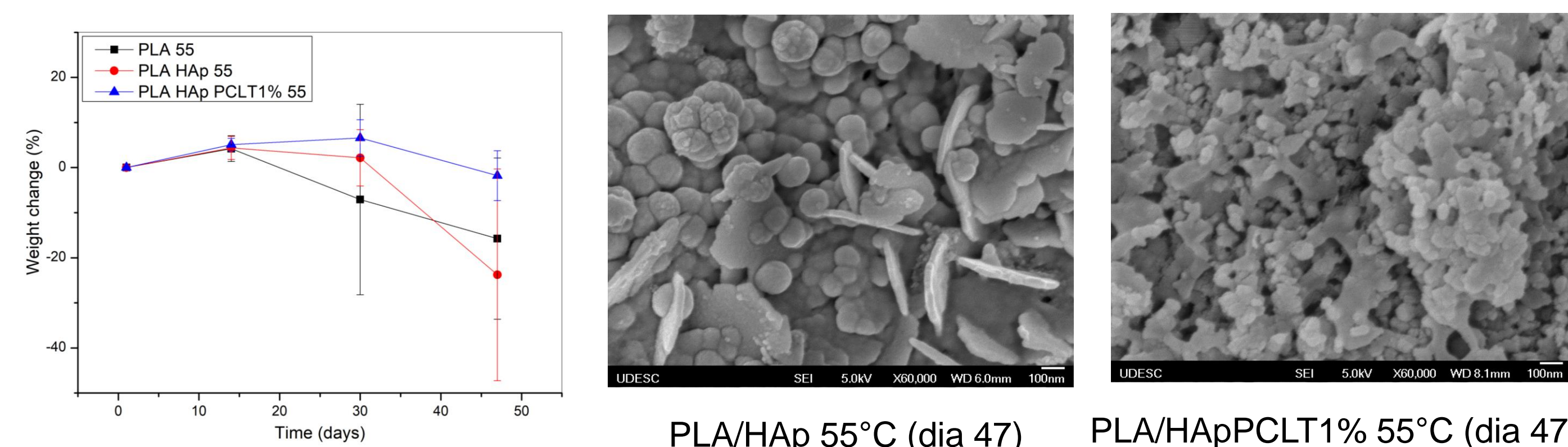


Fig. 3: Results of the in vitro bioresorption assay kept in PBS buffer at 55°C.

Scaffold PLA/HApPCLT1%

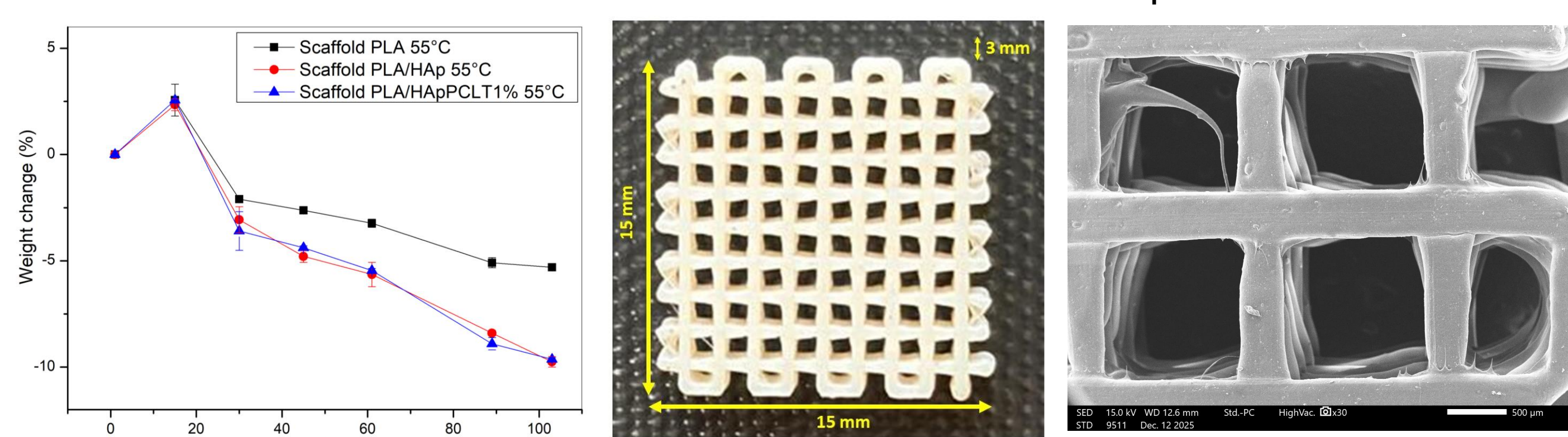


Fig. 4: In vitro bioresorption assay of the scaffold in PBS buffer at 55 °C, accompanied by photographic record and SEM.

CONCLUSIONS

In conclusion, modifying the surface of n-HAp using poly(caprolactone-triol) (PCLT) as a functionalization agent improved the compatibility between HAp and PLA, increasing the dispersion and disaggregation of hydroxyapatite within the PLA structures. Evidence was also obtained showing that functionalization succeeded in mitigating the degradation effect on the polymer matrix.

FUTURE WORK/

REFERENCES/ACKNOWLEDGMENT

Future studies should conduct osteoblast assays to evaluate cell proliferation and bone tissue formation potential, aiming at the application of the developed composites as bone graft substitutes.

AKINDOYO, et al. Composites Part A, 2017.//BIERNAT, et al. Molecular Sciences, 2022.// SAVICKI, UDESC, 2022

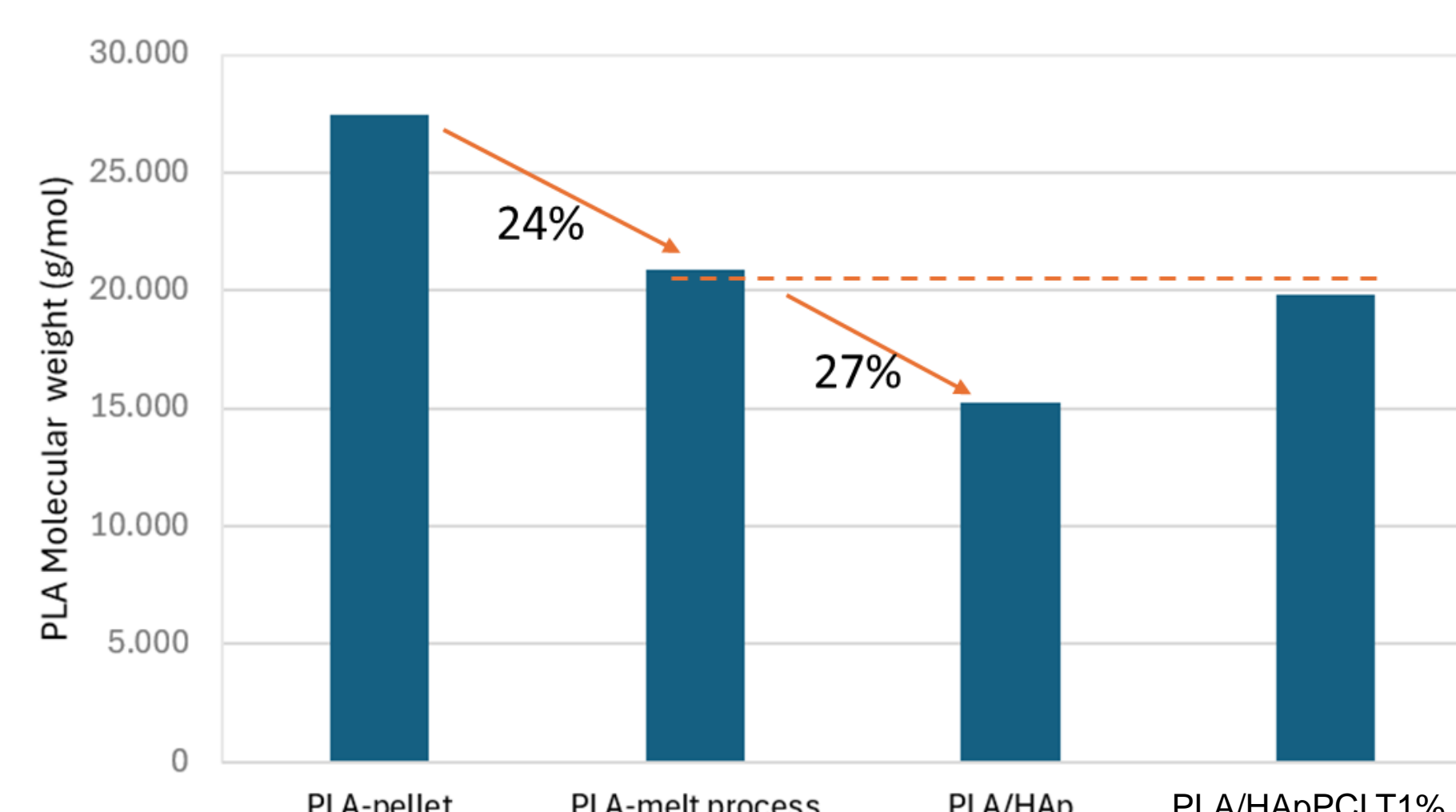


Fig. 5: Results of the molecular weight of the composite samples.