

Development of sustainable antimicrobial composites for bone repair

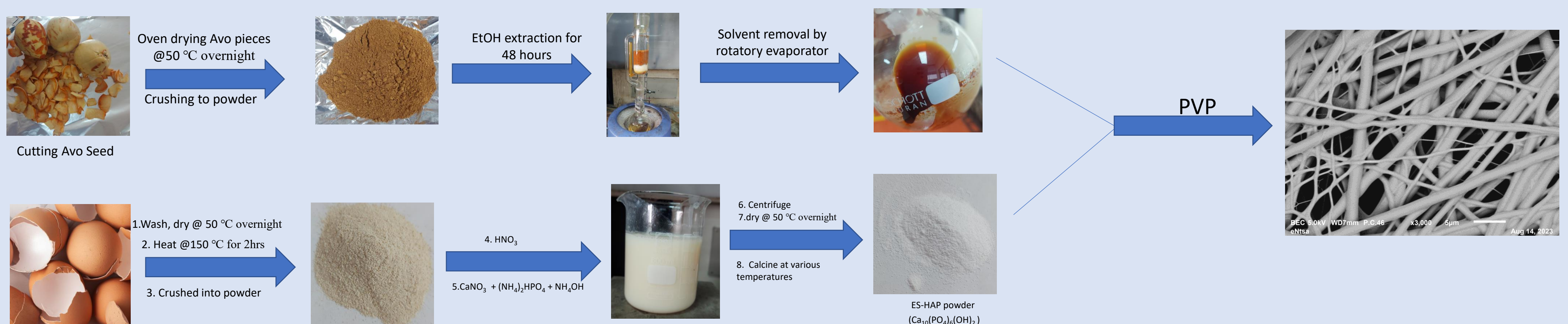
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Introduction

Bone fractures are inevitable and can be caused by trauma, accidents, sickness, aging, or disability [1]. In the absence of proper care, these can lead to morbidity, amputation/permanent disability, or mortality. Traditionally, bone repair has been achieved via use of metal devices made from stainless steel, titanium, and their alloys [2]. These are non-biodegradable, are prone to infection [3] and require second surgery to remove them [4]. Current research trends are focusing on the development of polymer scaffolds, either as nanofibers [5], injectable hydrogels [6], or 3D printed scaffolds [7] to tackle bone rejuvenation and repair. The requirements for the polymer composite of choice are that it must be nontoxic, biocompatible, biodegradable, hydrophilic, antimicrobial, and affordable. Although the concept is not new, most of the available technologies have been developed outside Africa and are still in their infant stages and the know-how (intellectual property) is usually protected through patents. The proposed work seeks to develop polymer scaffolds based on polyvinyl pyrrolidone in the presence of biosynthesized hydroxyapatite, bio-HAP [8], to mimic bone composition and facilitate bone regeneration [5]. Plant seeds extract as natural antimicrobial agents will be added to prevent infection. The scaffolds will be prepared via electrospinning. Chemical, morphological, bone healing studies will be presented.

Experimental



Results and Discussions

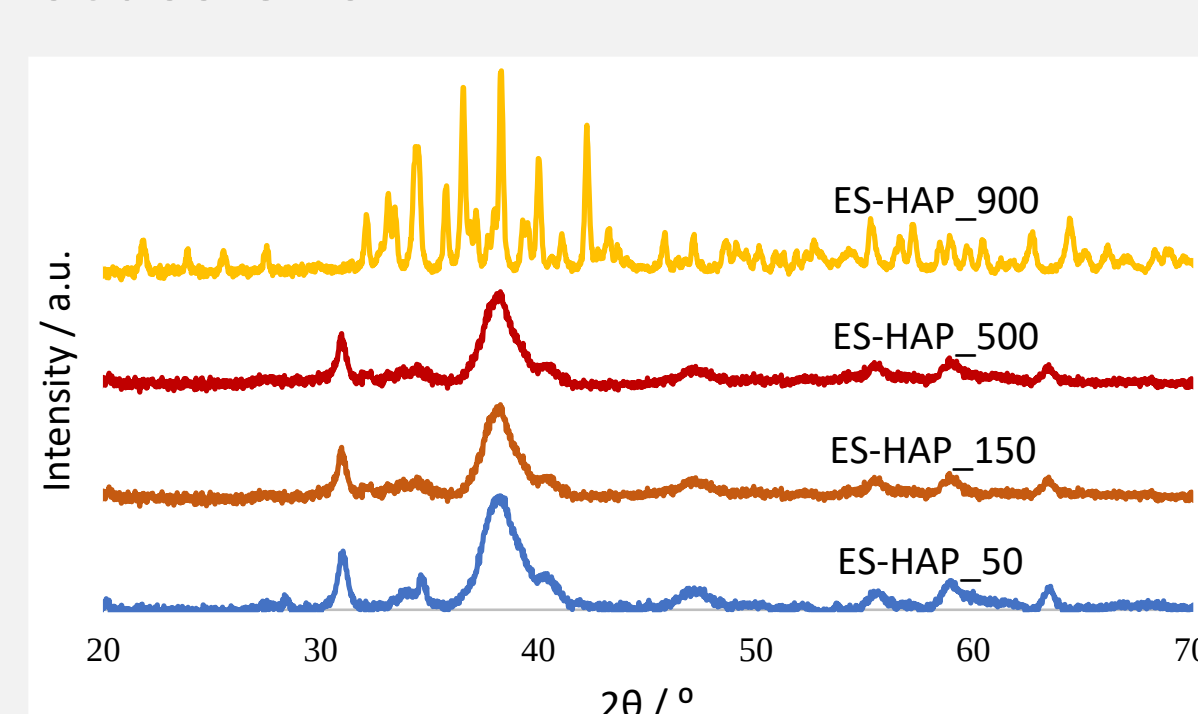
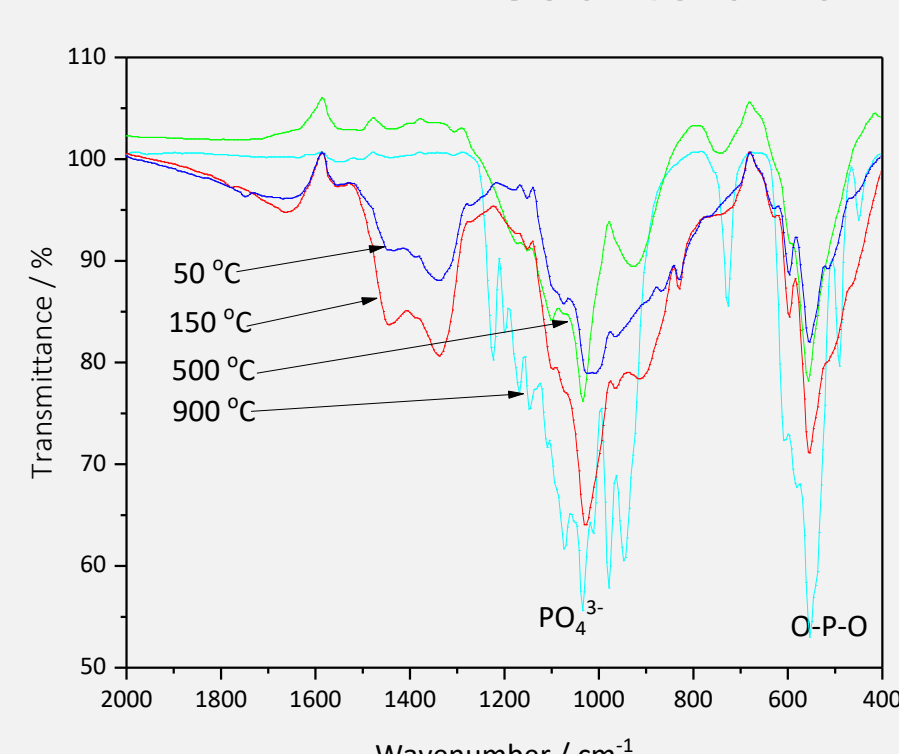
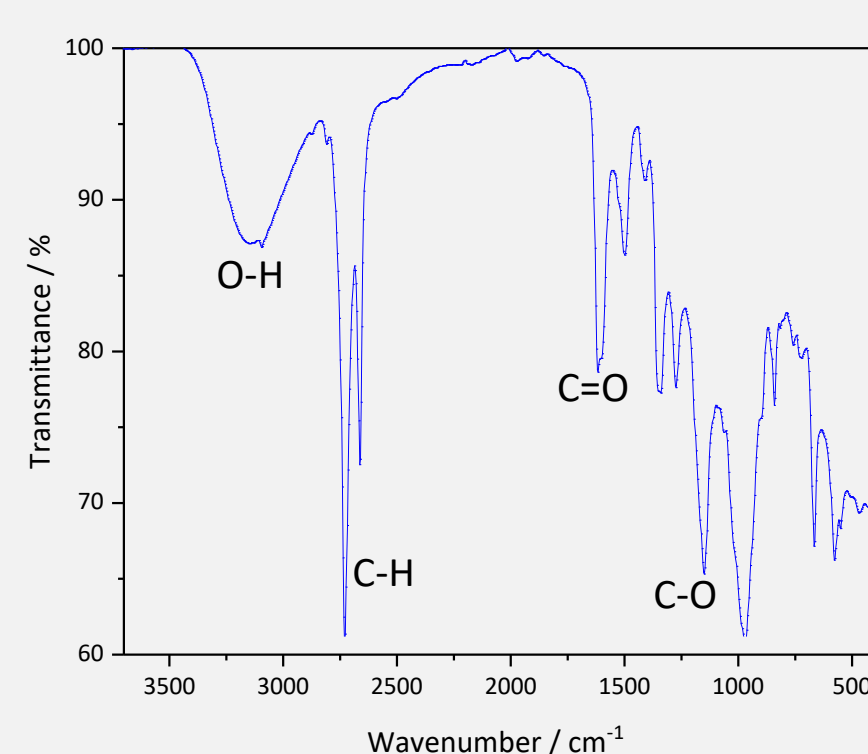
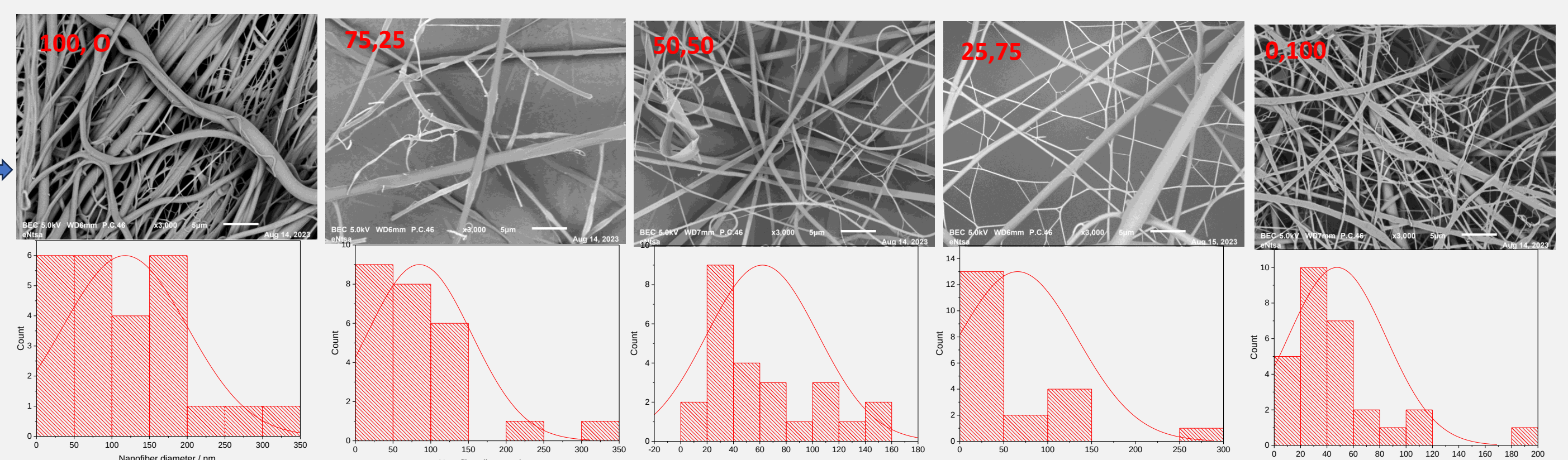
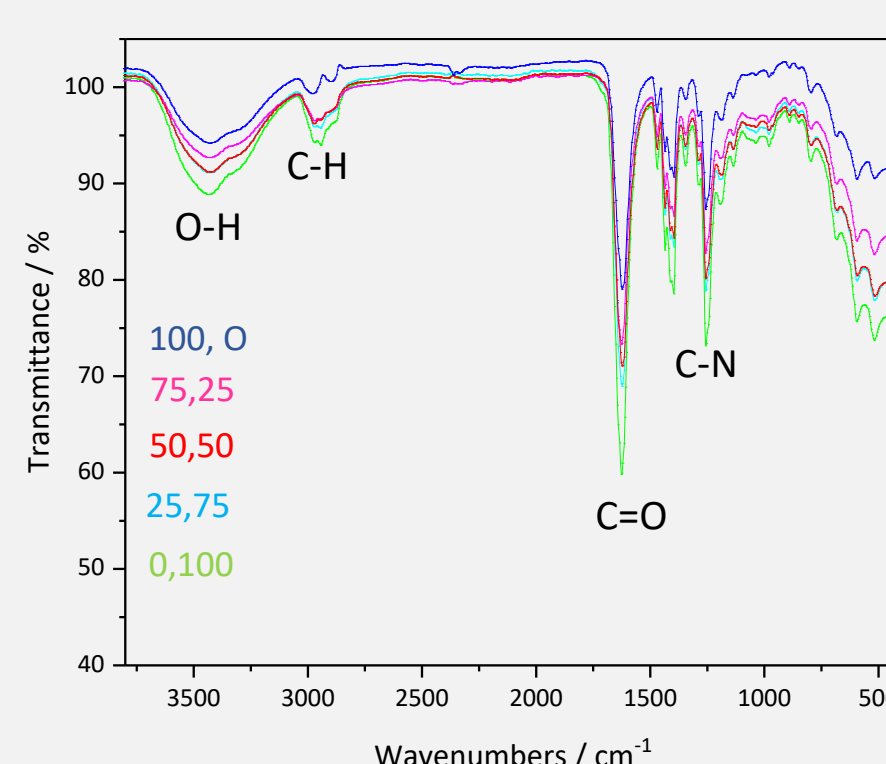


Table 1: Crystallite size of HAP vs Temperature

HAP Calcining Temp/ °C	Crystal size / nm
50	22.8
150	27.22
500	27.63
900	85.74



Conclusions and Future Work

-PVP/(HAP, Extract) nanofibers successfully developed and characterized

-In vivo bone healing experiments to follow

References

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