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THE PROCESSING AND CHARACTERIZATION OF POLYCAPROLACTONE SCAFFOLDS FOR BONE TISSUE ENGINEERING APPLICATIONS

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Human trabecular bones have a porous structure that varies in density and in mechanical properties depending on the location within the bone. To mimic the native tissue, the physical and mechanical properties of the scaffold should be controllable by adjusting the processing parameters of the fabrication technique such that the scaffold can be designed for specific patient needs. Furthermore, scaffolds for bone engineering should have sufficient mechanical properties to prevent failure in the material when under a load, and the use of nano-hydroxyapatite (nHA) as a biocompatible ceramic filler inside a polymer matrix has been shown to improve the mechanical properties in addition to biocompatibility and osteoconductivity compared to the neat polymer. The viscoelasticity of the scaffold is also important because the time dependent behaviour of polymers may cause undesired deformation when under dynamic loads. The use of hydroxapatite in the processing of gas foamed/salt leached scaffolds has not been widely studied and is the focus of this study. A parametric was performed to study the effects of processing parameters on the physical, mechanical, and viscoelastic properties of polycaprolactone-hydroxyapatite scaffolds. Although the particles improved the mechanical properties of the polymer significantly, the processed scaffolds had poorer results. The decrease in mechanical properties may be attributed to the poor interface between the polymer matrix and the filler particles. Further testing on the viscoelastic behaviour of the polymers and scaffolds may further support this observation, as composites with higher nHA contents exhibited a more viscoelastic response.