Optimisation Of The Porous Structure Of PolyHIPE Scaffolds For Angiogenic Applications.

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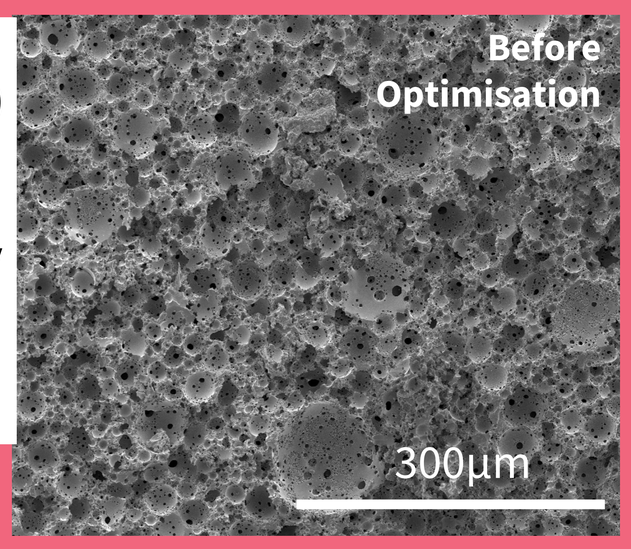
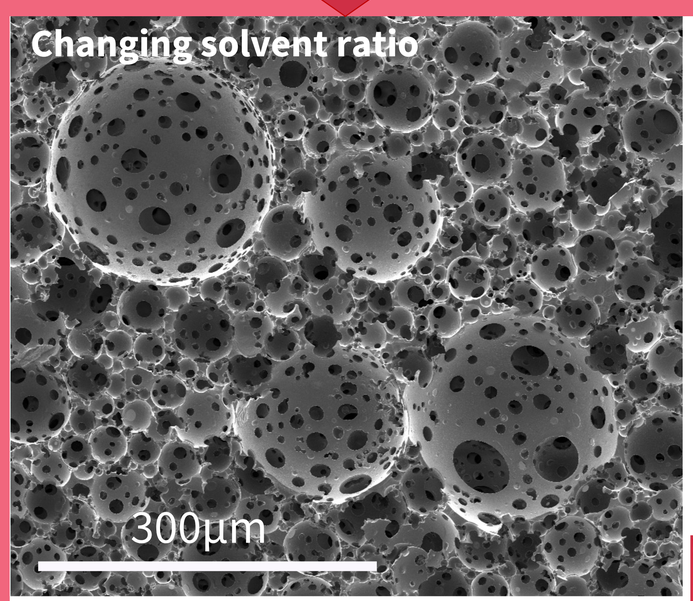
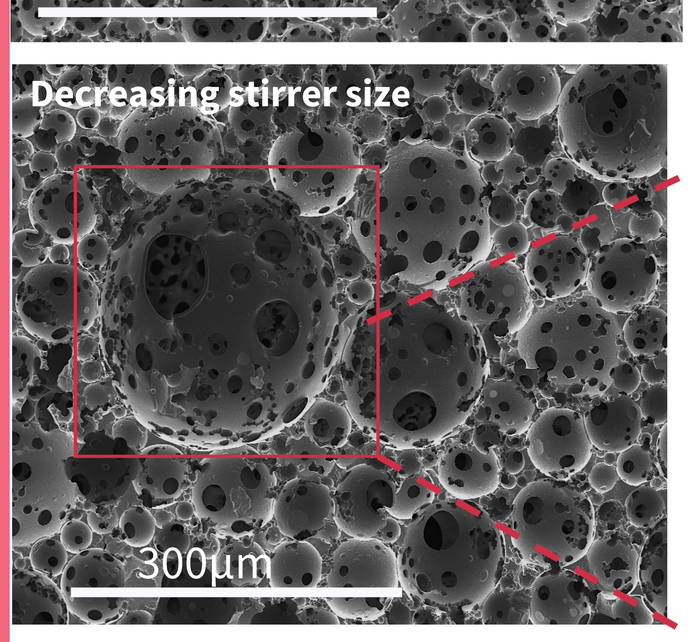
PolyHIPE Optimisation

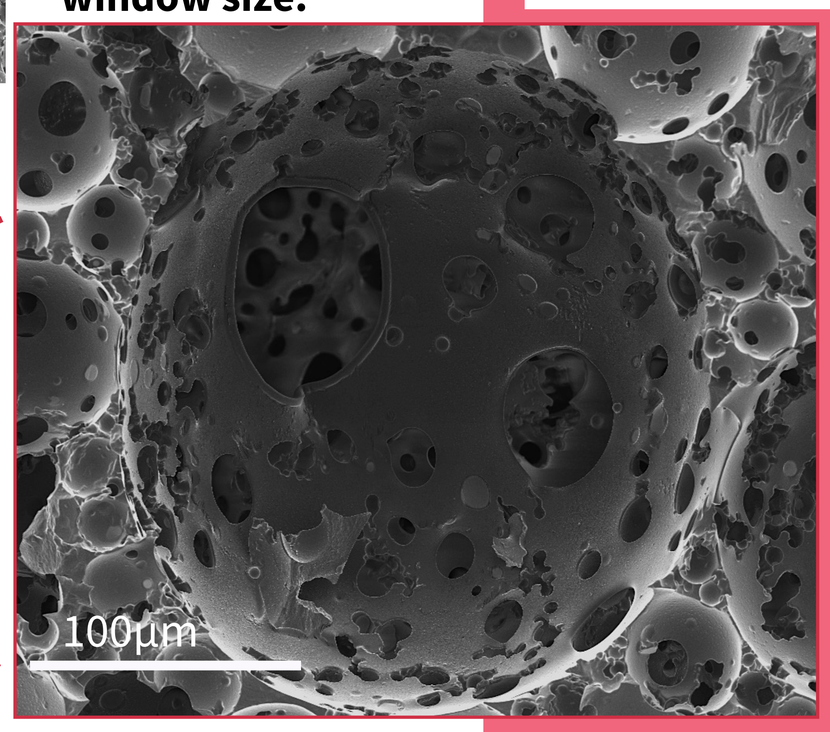
- **PolyHIPEs (polymer high internal Phase Emulsion) scaffolds are highly porous structures.**
- **The structures are highly tuneable based on the parameters used in the manufacturing process .**



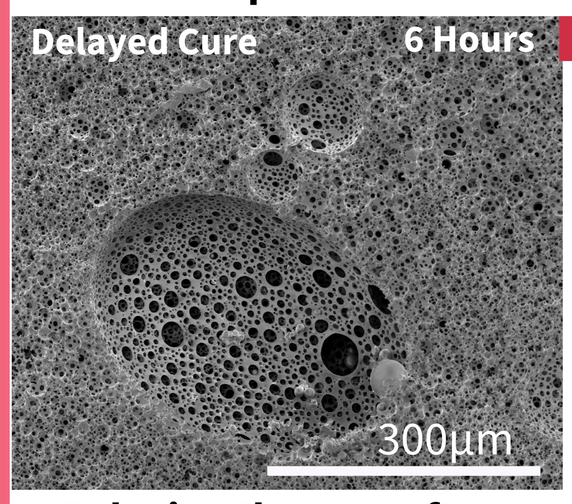


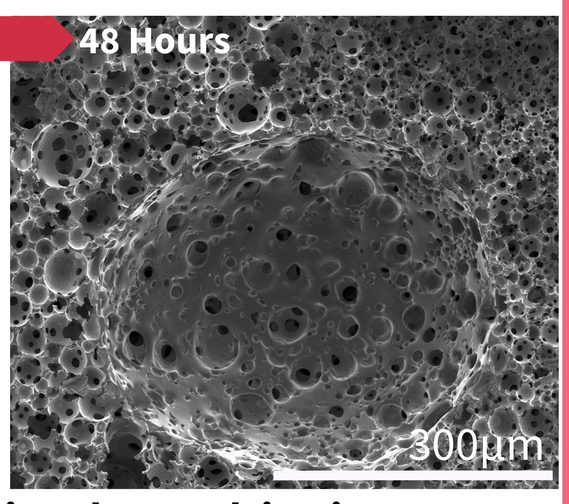
- **Changing the solvent ratio impacts the porous structure of the scaffold.**
- **Increasing Chloroform concentration increases pore and interconnecting window size.**



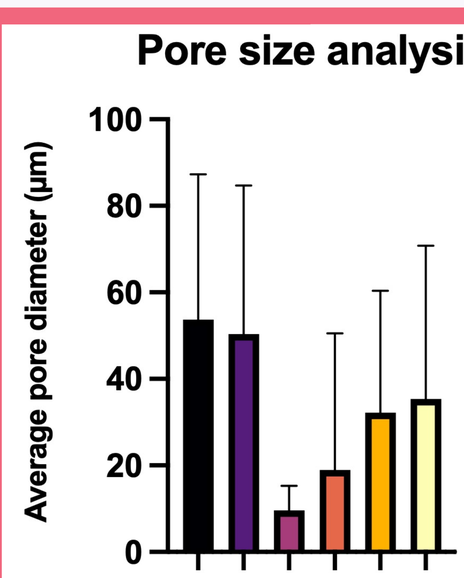


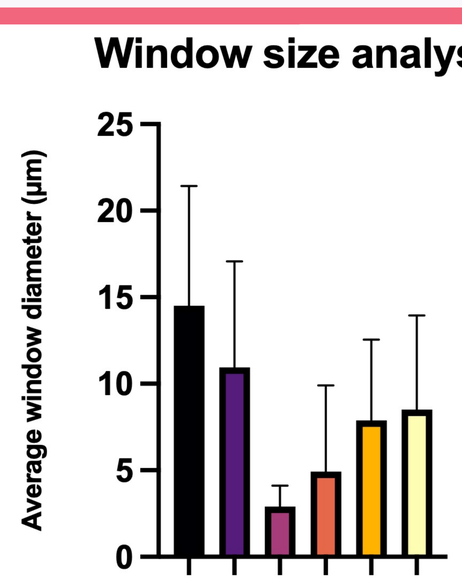
- **Decreasing the stirrer size increases pore size and window size**





- **Delaying the cure after creating the emulsion increases the pore and window size.**
- **The longer the delay, the larger average pore size.**
- **Delaying the cure also creates less consistent structures, with a large deviation in pore structures.**





50C/10mm/4mlWater
50C/6C4T/4mlWater
37C/2C8T/4mlWater
50C/6C4T/6hrDelay/4mlWater
37C/24hrDelay/4mlWater
37C/48hrDelay/4mlWater

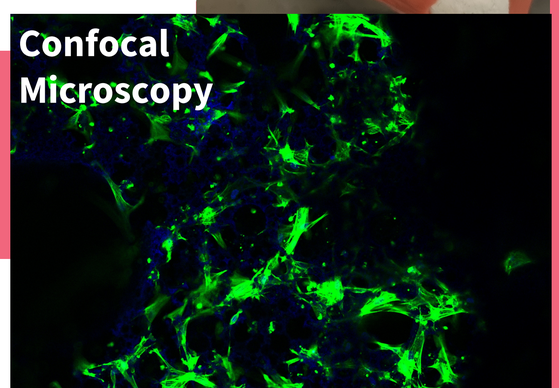
- **Scanning Electron Microscopy (SEM) was used to image each scaffold configuration.**
- **These images were then measured to calculate the average pore/ window sizes along with the standard deviation.**

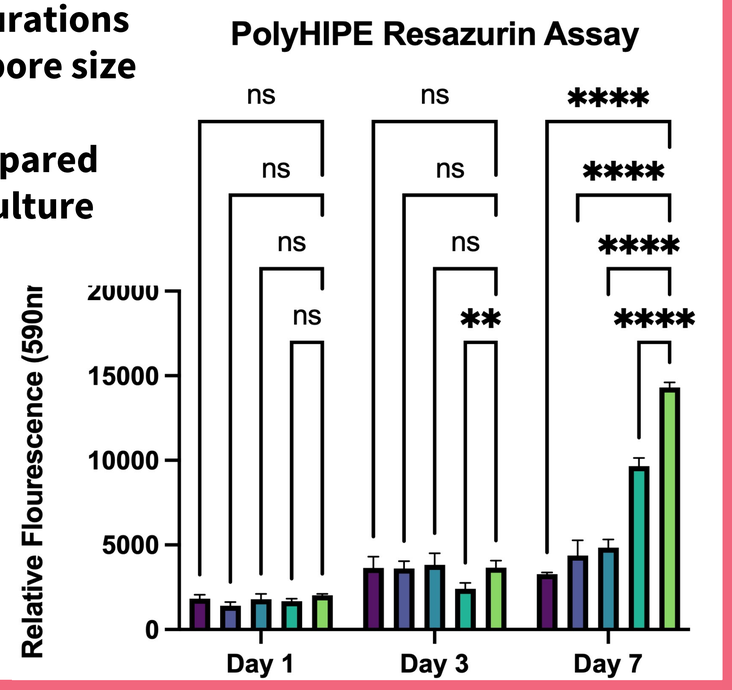
Application

- **Artificial periosteal substitutes can be made from polyHIPEs to encourage vascularization into newly forming bone.**
- **Scaffolds can be made into flexible strips which can be wrapped around fractures.**
- **These scaffolds should be Highly porous to allow for blood vessel integration and cell migration.**

Biological Viability

- **PCL:PGS Polyhipe scaffolds have demonstrated viability by growing Y201 Mesenchymal Stem Cells (MSCs) on the surface and within the pores.**
- **Resazurin assays (RA) were performed on day 1, 3 and 7 on multiple scaffold configurations to determine the effect pore size has on cell behaviour.**
- **The RA results were compared alongside standard 2D culture plastic.**





50C/10mm/4mlWater
50C/6C4T/4mlWater
50C/6C4T/6hrDelay/4mlWater
37C/2C8T/4mlWater
2D TCP Control

In partnership with:

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