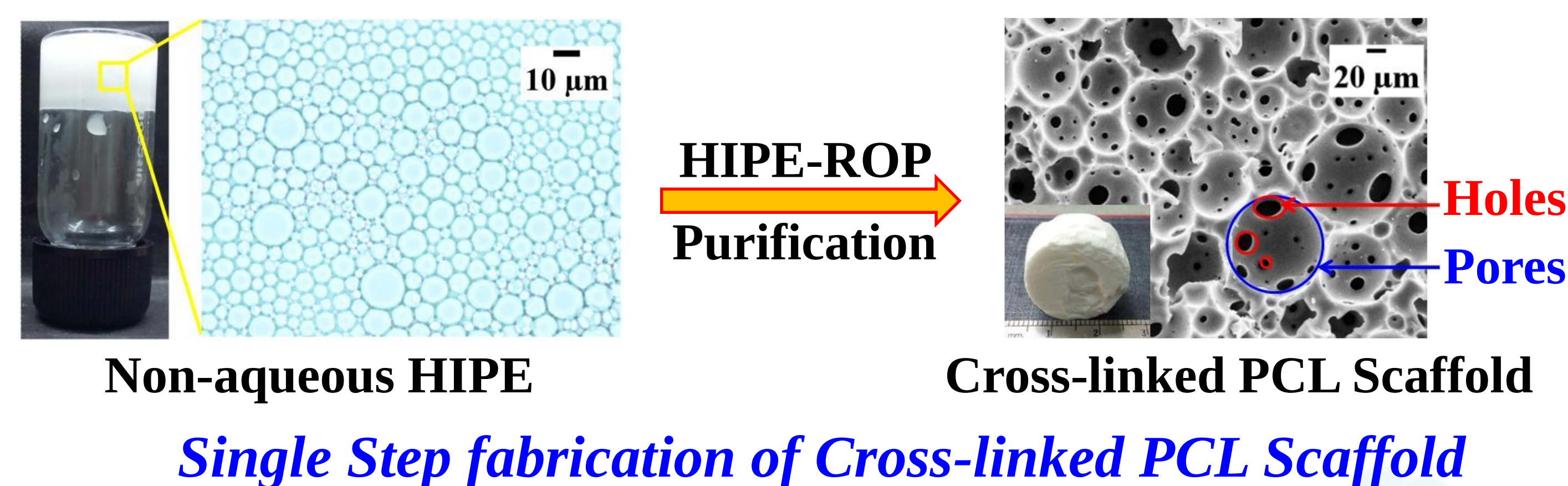


Single Step Production of Intricate Scaffolds of Cross-linked Poly(ϵ -caprolactone) for Bone Regeneration

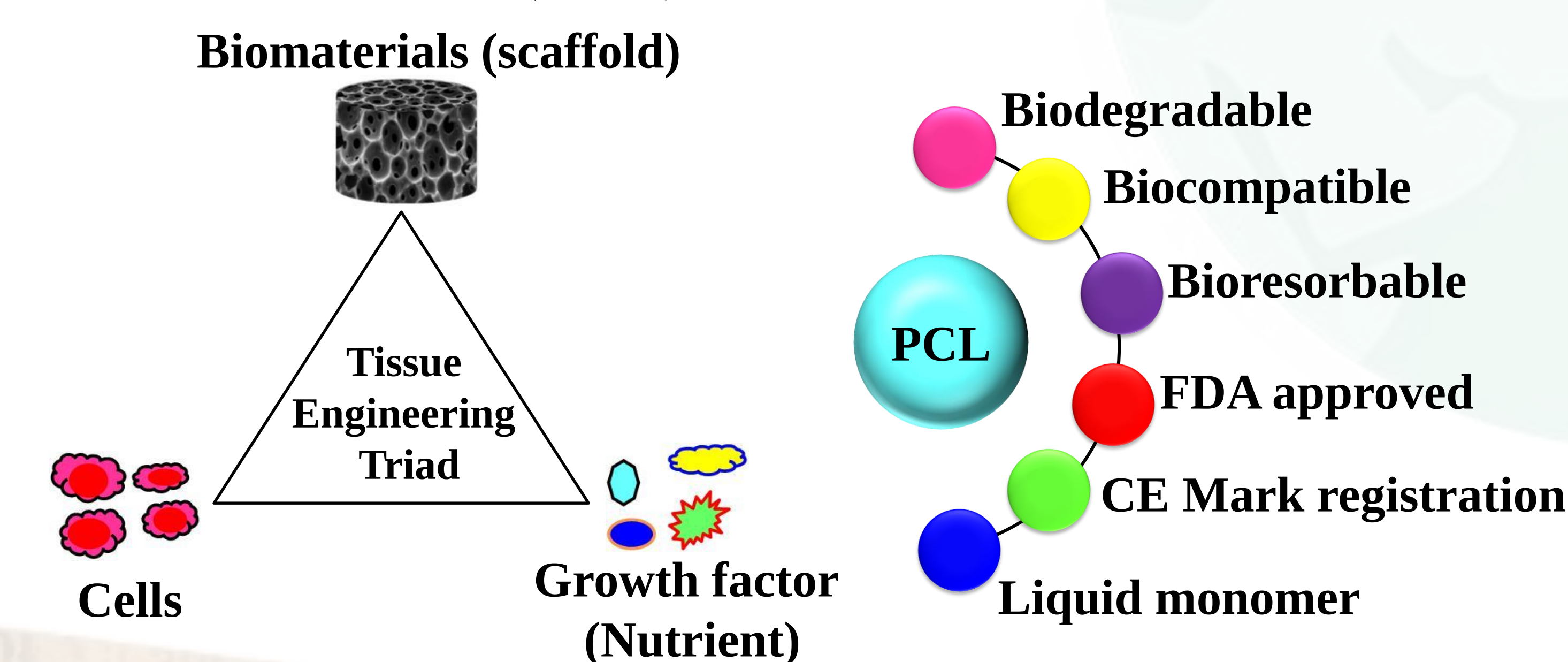
Anilkumar L. Yadav, Bhanu Nandan, Rajiv K. Srivastava*

Abstract

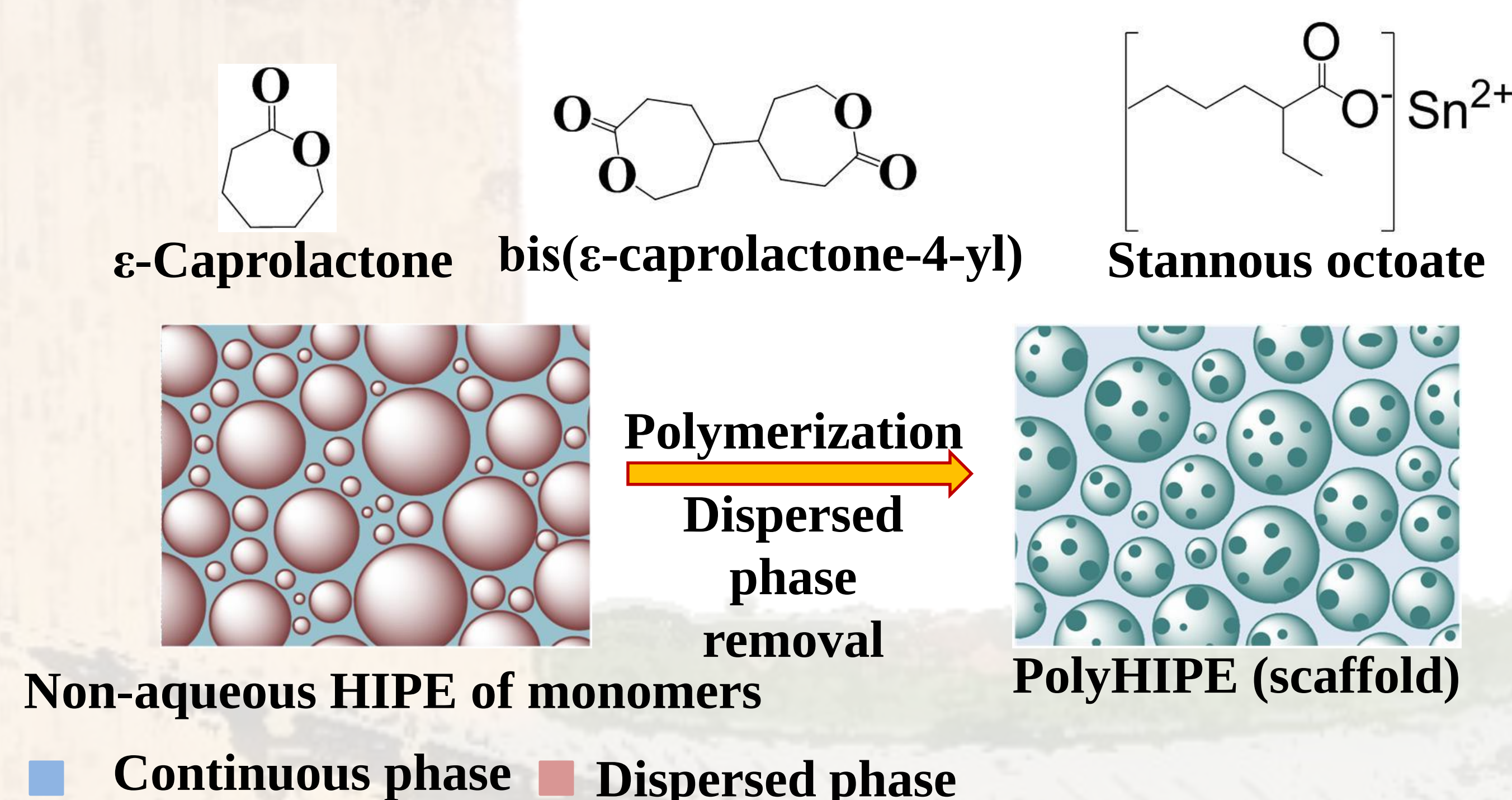


Introduction

- Need of a single step **fabrication process** to create 3D porous scaffolds of intricate shape for Tissue Engineering and other applications
- \$3 billion market (2017), **CAGR of 9.1 %**



Materials and Methods



Conclusions

- HIPE-ROP of ϵ -Caprolactone was conducted to devise a single-step, facile fabrication process to create 3D porous scaffolds of intricate shapes
- Approach allowed in-situ cross-linking during scaffolds fabrication
- Compressive loading and swelling capacity of scaffolds was found to be significantly high
- The porous scaffolds showed excellent osteoblast attachment and proliferation

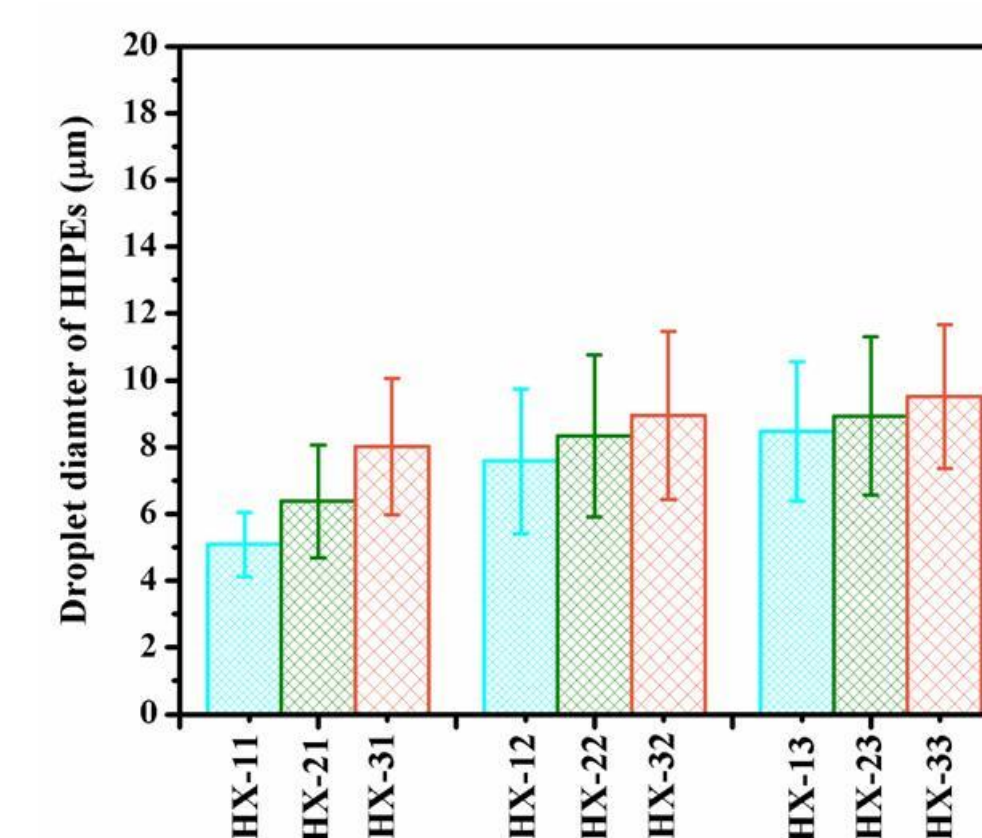
References

- US Patent application number: US20190077933
- Indian Patent application number: IN201711031869

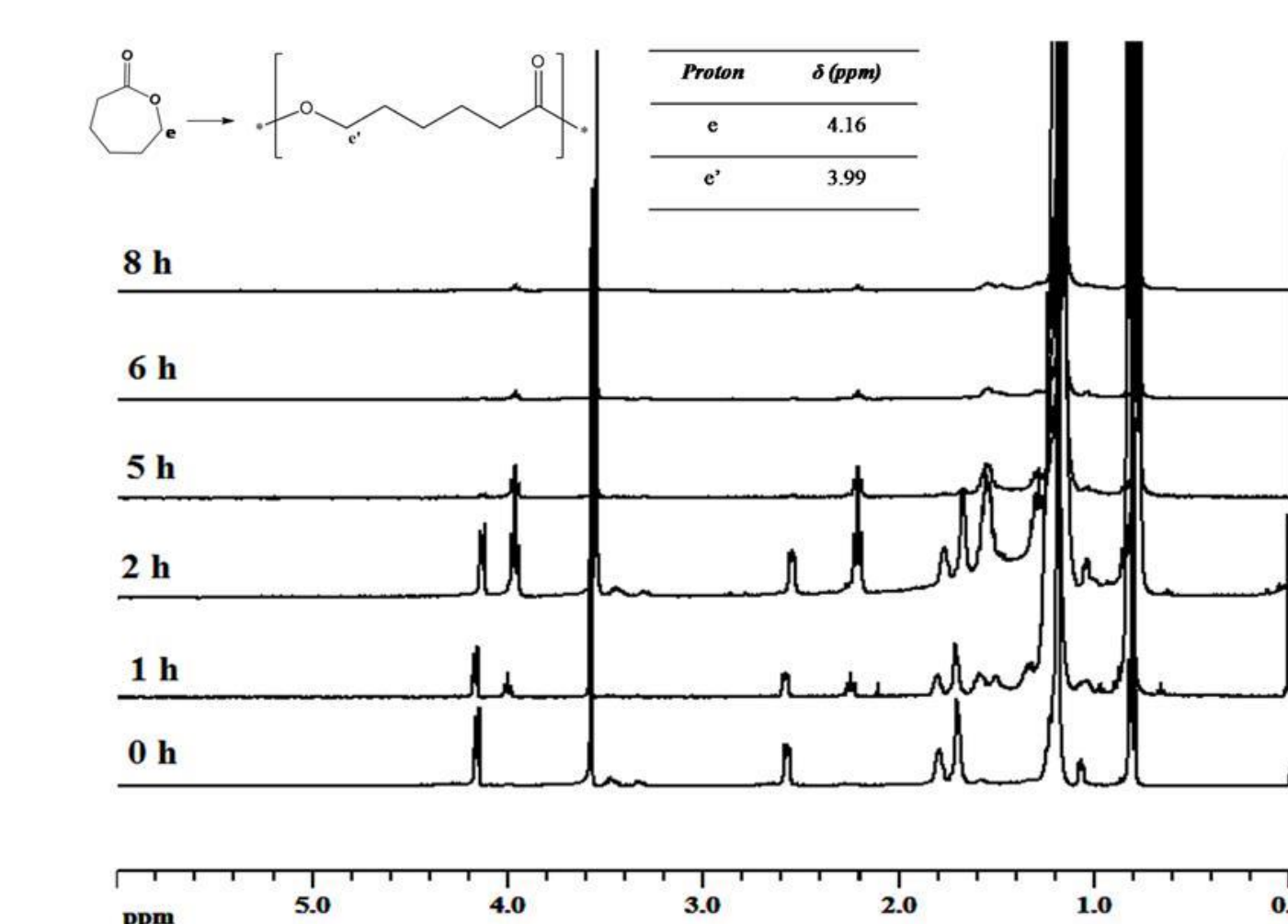
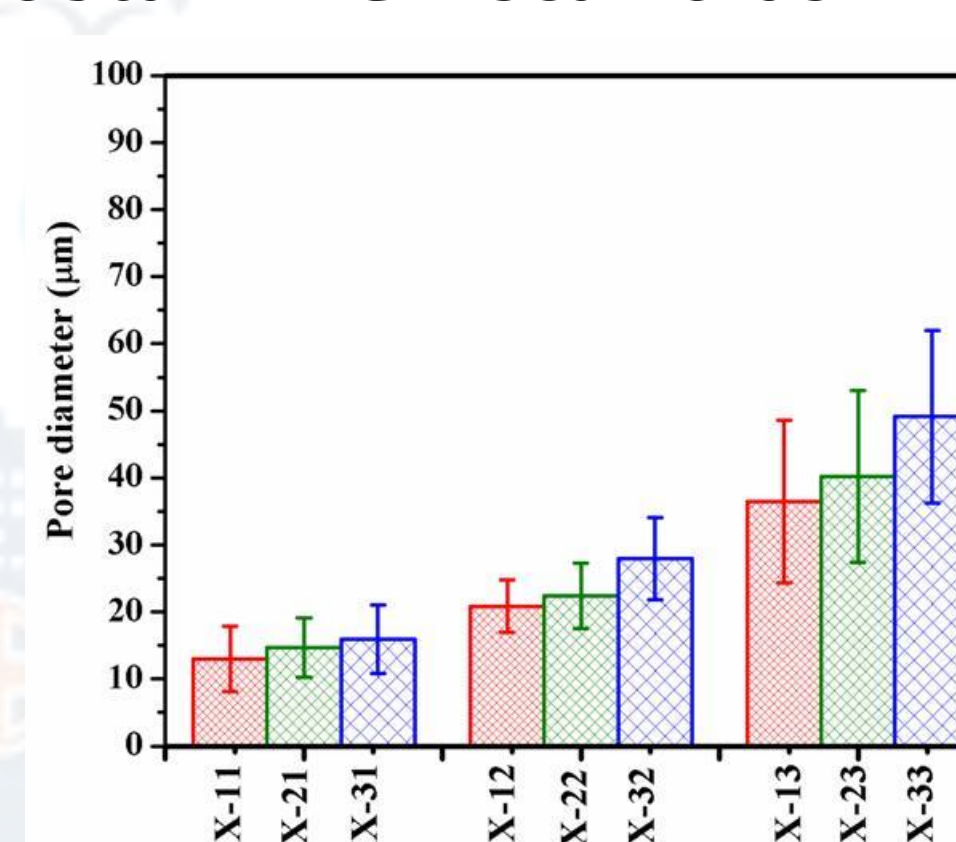
Acknowledgements

- Indian Institute of Technology Delhi
- Department of Science and Technology, India for their financial support (Grant number: EMR/2017/002033)

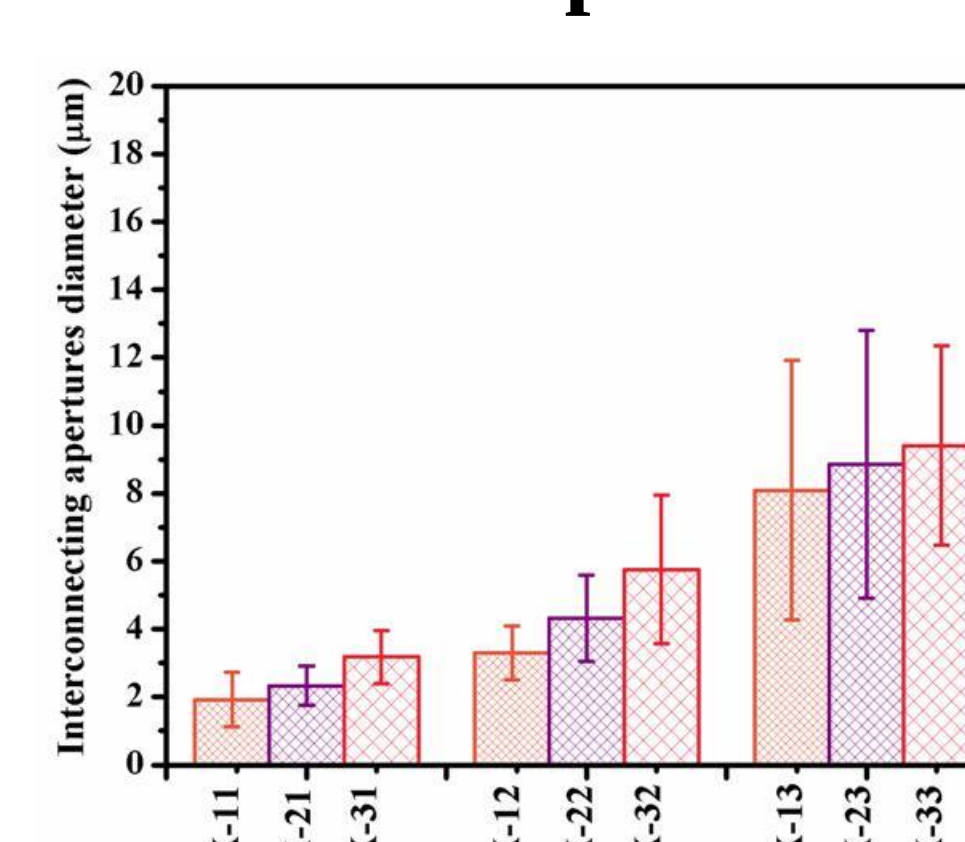
Results



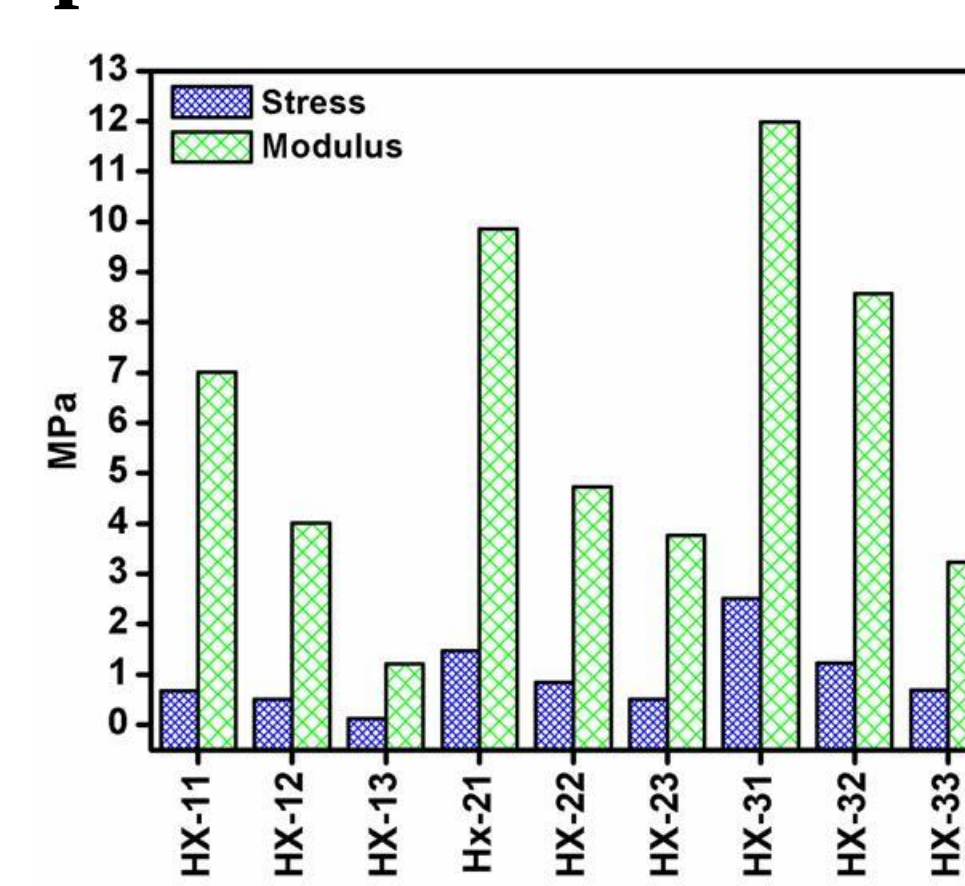
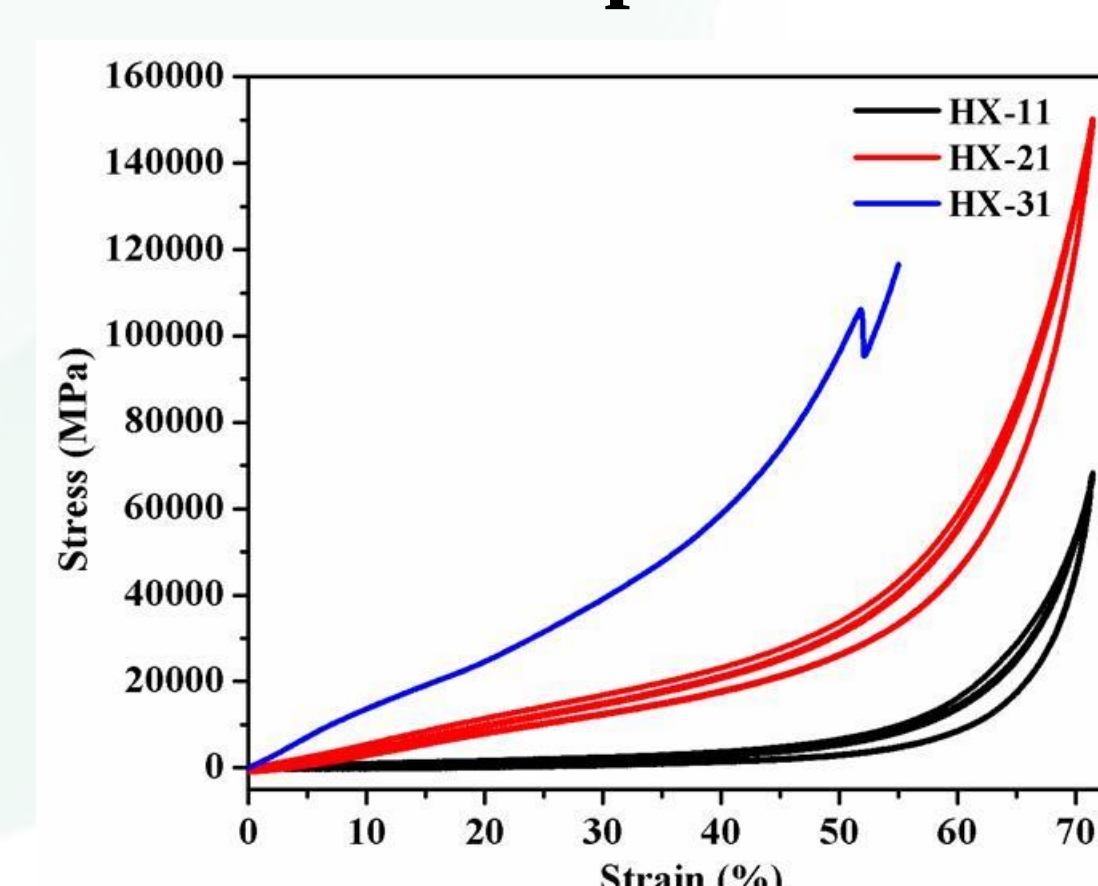
Droplet size of HIPEs polymerized to obtain PCL scaffolds



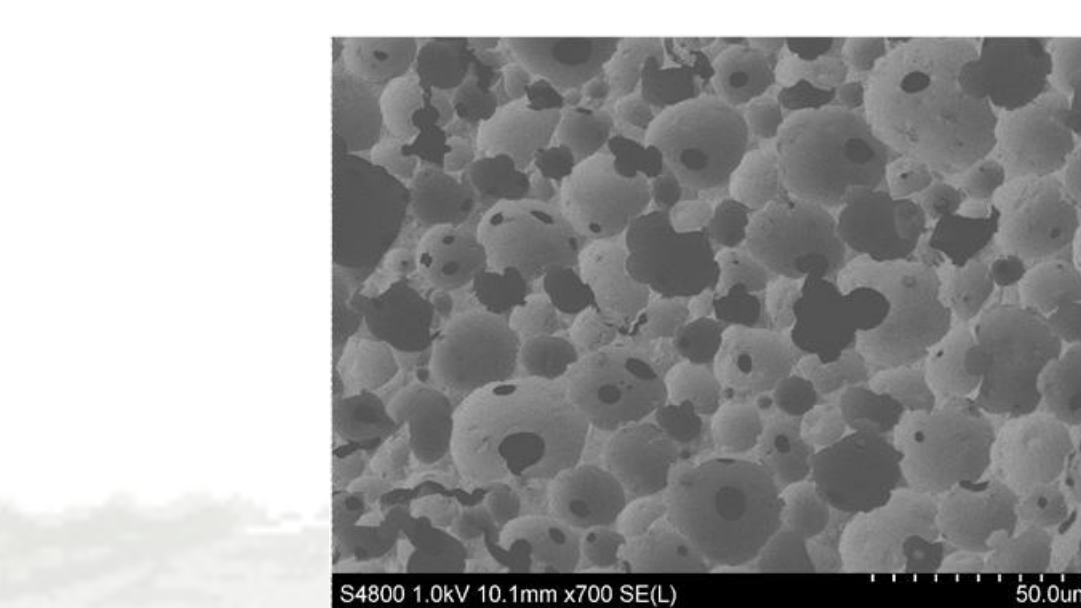
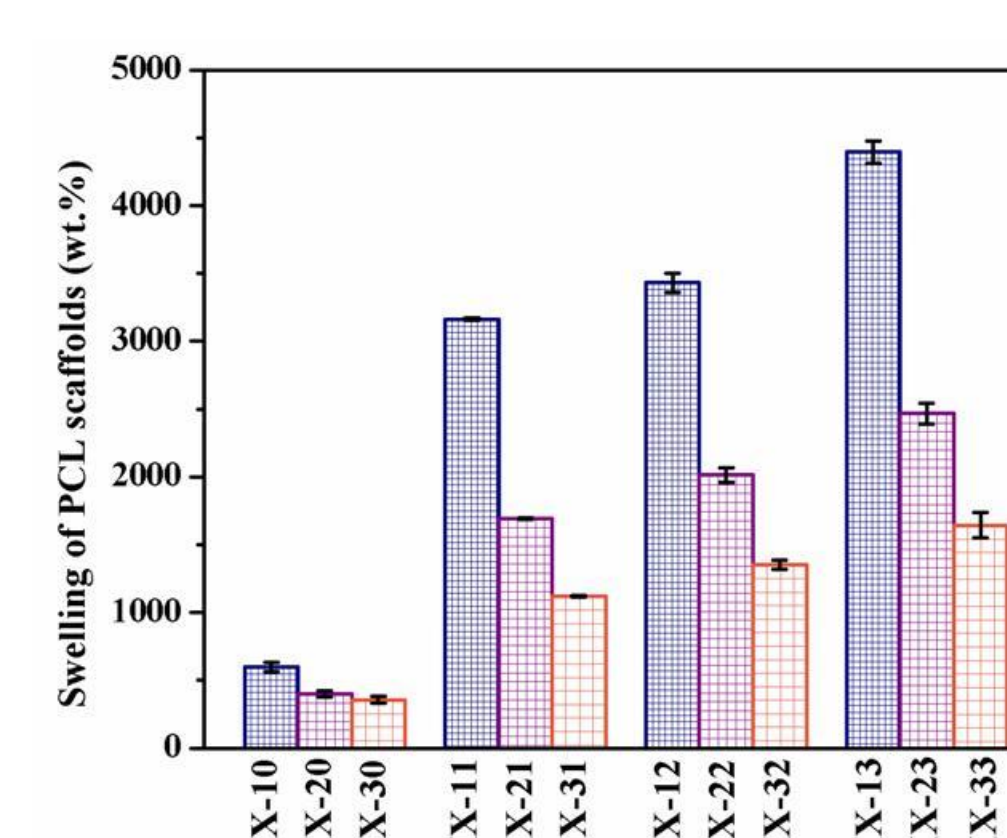
^1H -NMR spectra of HIPE-ROP



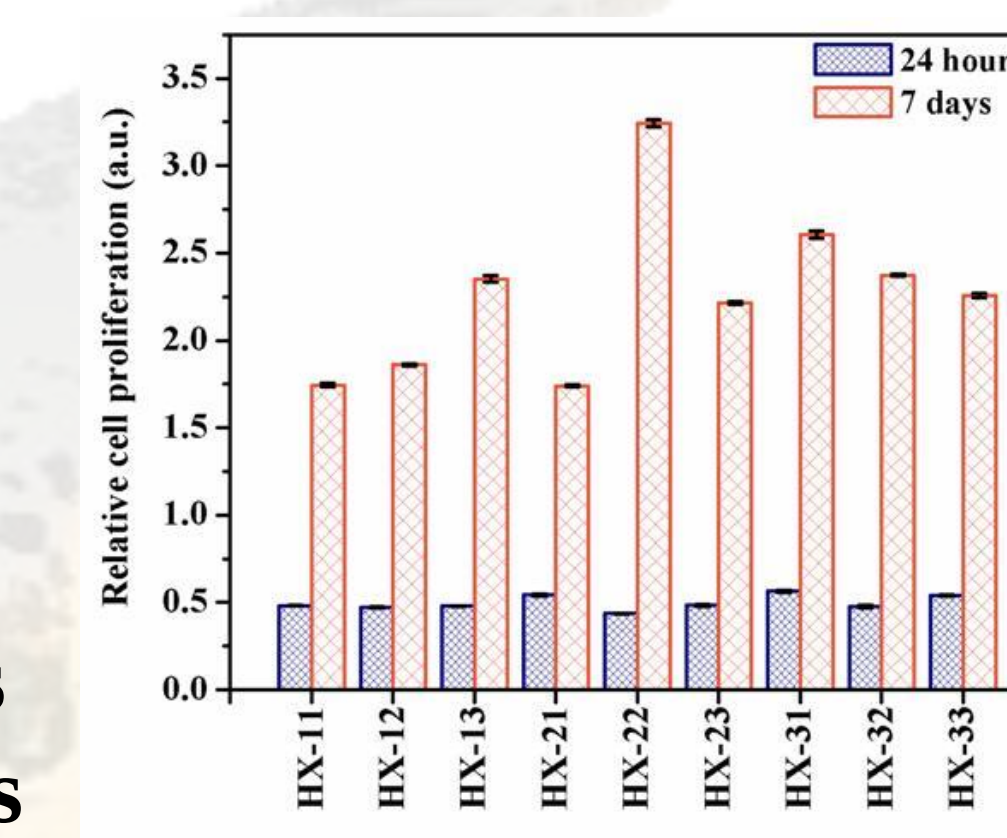
Dimensions of pores and holes present in the PCL scaffolds



Stress-strain curves for PCL scaffolds and Young's modulus



MTT analysis of PCL scaffolds against Osteoblast (MG63) cells



Industrial Significance

- A single-step process to obtain 3D porous scaffold based on aliphatic polyester(s) with/without cross-linking
- Control on pore size and interconnectedness via tailoring the HIPE formulation and polymerization conditions
- Scaffolds adapted for multifaceted applications e.g. tissue engineering, selective sorption and separation, biodegradable adsorbents
- High commercial viability for conversion to continuous process from a batch process

Technology Readiness Level

- Demonstrated lab scale production of scaffolds having different batch size, shape and properties
- Proven potential as tissue engineering implant (*in-vitro*) and biodegradable adsorbent with high reusability
- Scaffolds functionalized with nanomaterials for better suitability to desired application