Biporous Scaffolds from 2-Methylene-1,3-Dioxepane: a Smart Synthetic Alternative to Classical Poly(ε-Caprolactone) (Co)Polymer-Based Materials Meant for Tissue Engineering

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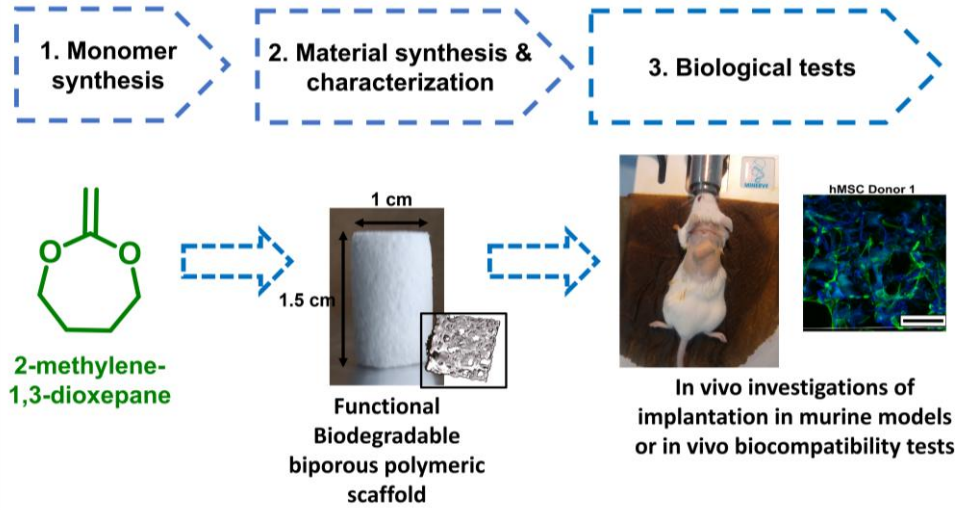
Résumé :
Polymeric porous scaffolds prepared from poly(ε-caprolactone) (PCL) have been so far extensively developed for the synthesis of biomaterials in tissue engineering applications. However, these polymeric materials suffer from a lack of functionalization routes. To address this limitation, our recent research aims at synthesizing crosslinked PCL-like scaffolds via ring-opening copolymerization of a cyclic ketene acetal, i.e. 2-methylene-1,3-dioxepane, in the presence of a crosslinker, divinyl adipate, and a radical initiator, namely azo-bisisobutyronitrile. A double porosity is obtained through the double porogen templating approach, using sieved and sintered NaCl particles and a solvent as porogenic agents. This versatile strategy allowed for the preparation of various PCL-like biporous scaffolds in which the porosity features can be tuned by controlling experimental parameters (type and volume fraction of the porogenic solvent, amount of crosslinking agent).[1] These novel scaffolds exhibit pH-dependent degradability, highwater uptake (up to 2300%), exceptional compressibility, and shape memory behaviour upon consecutive compression cycles. Moreover, these scaffolds can be further functionalized through incorporation of functional monomers in the polymerization feed.[2] Various as-prepared functionalized materials notably showed good biocompatibility toward a variety of cell lines.



Scheme 1. Synthesis and characterization of biporous materials arising from 2-methylene-1,3-dioxepane and consecutive biological in vivo and in vitro investigations.

Références :

[1] : B. Barber Nunez, Y. Guillaneuf, D. Grande, Benjamin Carbonnier, B. Le Droumaguet, *Polymer*, 2024, **308**, 127332.
[2] : B. Barber Nunez, Benjamin Carbonnier, D. Grande, B. Le Droumaguet, *Reactive and Functional Polymers*, 2025, **214**, 106284.