Emulsion-Templated Macroporous Hydrogels as Degradable and Bioactive Scaffolds Tailored for Soft Tissue Engineering

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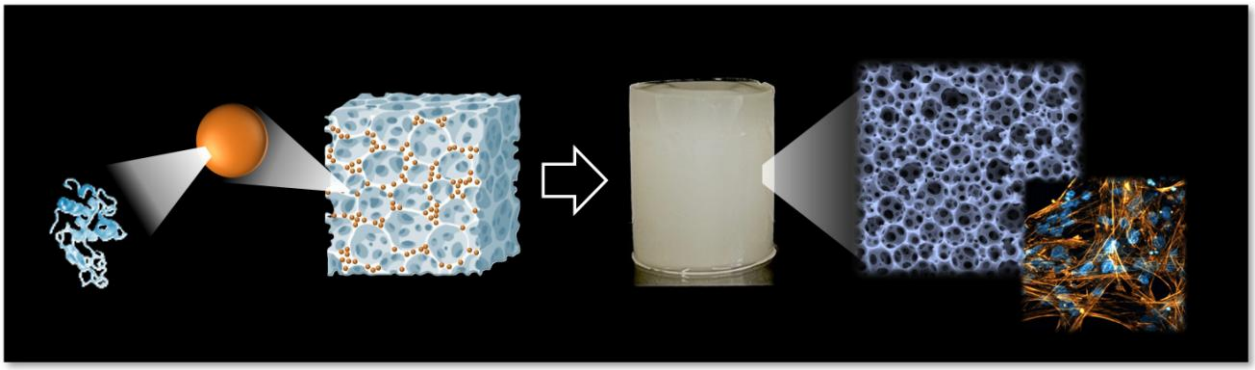
ABSTRACT

Synthetic porous scaffolds are key elements in tissue engineering, where controlled porosity, tunable degradability, adapted mechanical properties and bioactivity are required to support cell infiltration and tissue regeneration. This communication presents the development of emulsion templated macroporous hydrogels as scaffolds for soft tissue engineering, combining the hydrophilicity of some polyphosphoesters (PPE) or dextran-based networks with the structural versatility of high internal phase emulsion (HIPE) templating method.[1,2] Photocuring methacrylated PPE- or dextran-based precursors under HIPE conditions enabled the formation of interconnected macroporous hydrogels with tunable porosity and mechanical properties tailored for soft tissue applications. The resulting scaffolds displayed controlled hydrolytic degradation under physiological conditions and excellent cytocompatibility, with RGD-functionalization improving cell adhesion.[1] In addition to traditional surfactants, PLGA nanoparticles served as both emulsion co-stabilizers and nanocarriers which improved the emulsion stability while enabling the integration of bioactive agents in the scaffolds.[2] *In vivo* subcutaneous implantation of the PPE-based scaffolds confirmed their good tissue integration, limited inflammatory response, and angiogenic potential.[1] Overall, these results highlight the great potential of emulsion-templated macroporous hydrogels as versatile and bioactive platforms for soft tissue engineering and regenerative medicine.



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