A TUNEABLE SUPRAMOLECULAR HYDROGEL BASED ON DECELLULARIZED HEART TISSUE

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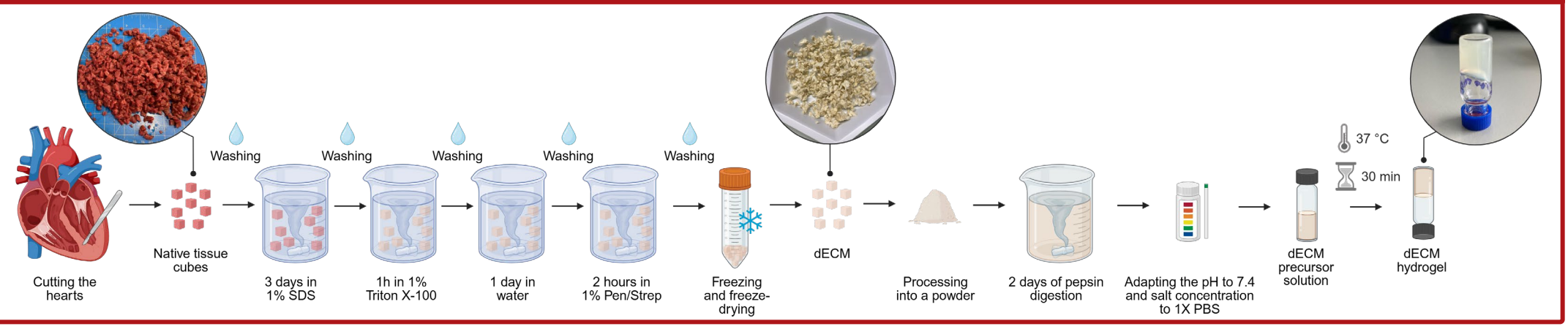
MOTIVATION

Decellularized extracellular matrix (dECM) has shown great potential in tissue engineering since it inherently possesses the complexity of native tissue and can be processed into ECM-mimicking hydrogels.[1] Since a downside of dECM-based hydrogels are their weak mechanical properties, supramolecular host-guest interactions have been used to improve them.[2] Here, we developed a thermally gelling heart dECM-based hydrogel, which can be reinforced by secondary host-guest crosslinks induced by photopolymerization of acrylated β-cyclodextrin (Ac-β-CD). With tissue-specific biochemical compositions and tunable mechanical properties, such hydrogels are promising for the development of 3D *in vitro* heart tissue models.

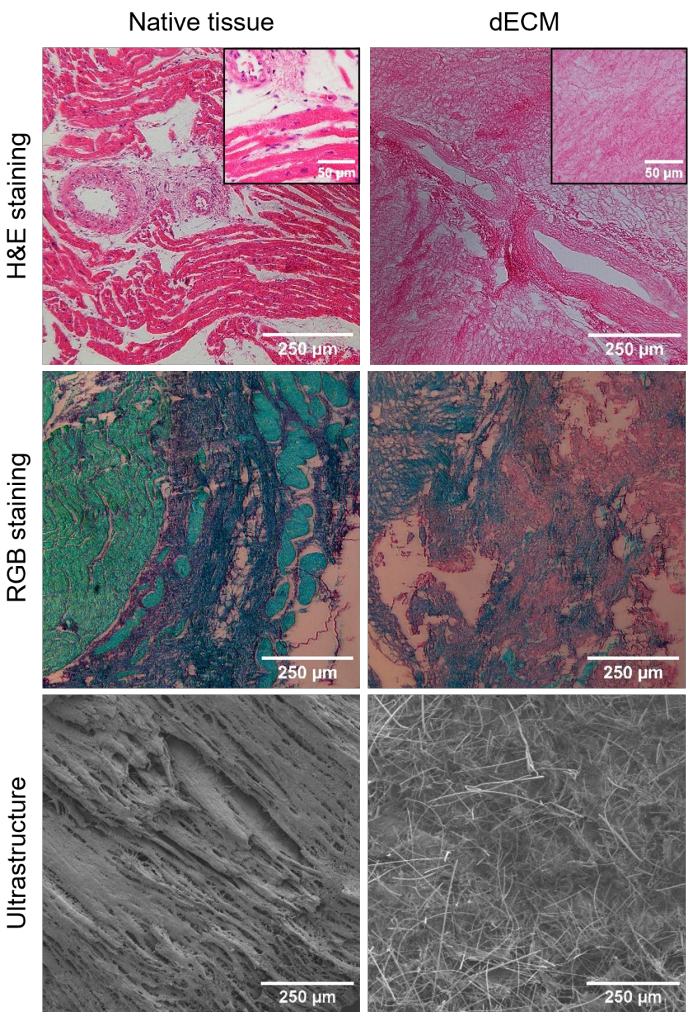
SUMMARY

- Free from chemical functionalization of the dECM components, the hydrogel's mechanical properties can be controlled in two independent stages, namely thermal gelation and photocrosslinking.
- Adding Ac-β-CD to the dECM precursor leads to an increased G' through stabilization of the self-assembled dECM.
- Increasing amounts of Ac-β-CD can modulate the thermal self-assembly of the dECM.
- Using such hydrogels as replicates of tissue-specific ECM offers a promising strategy for biofabrication of cardiac tissue.

DECELLULARIZATION AND SOLUBILIZATION METHOD

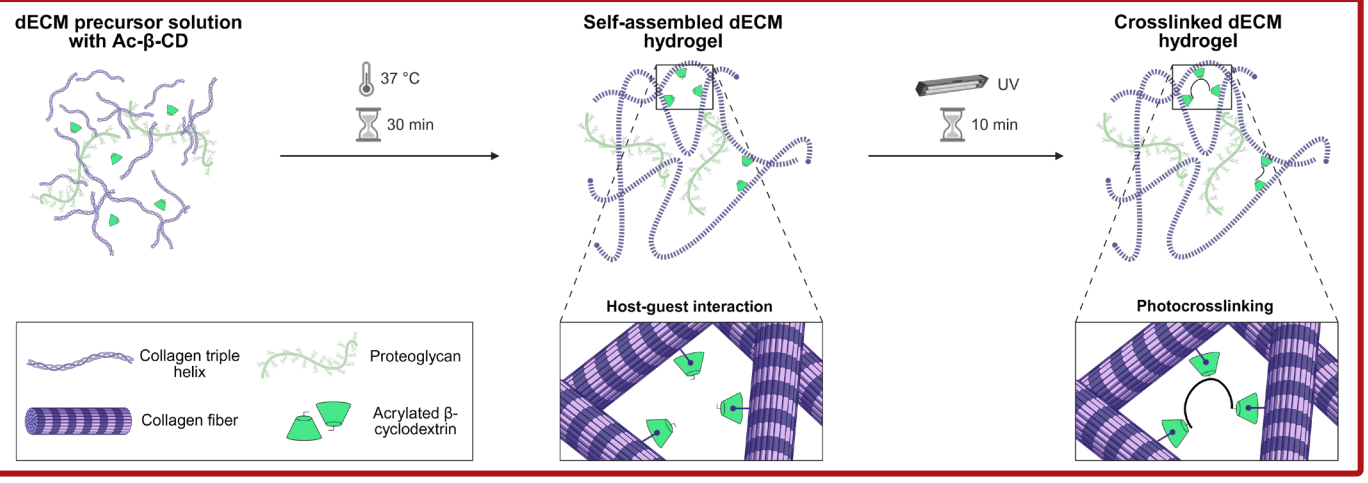


CHARACTERIZATION OF dECM

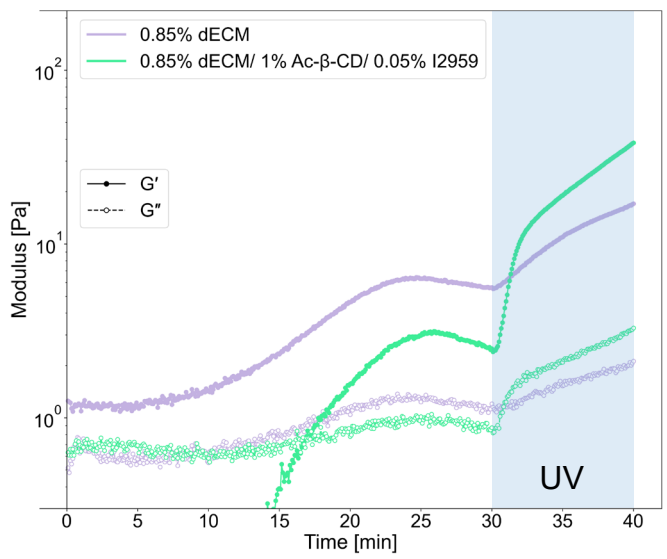


Stainings and scanning electron microscopy reveal that the decellularization was successful and that important ECM components could be maintained.
H&E: Hematoxylin & Eosin staining (nuclei stained in purple and cells/ ECM components stained in pink).
RGB: Red-Green-Blue staining (collagen stained in red, cellular proteins stained in green and glycosaminoglycans stained in blue).

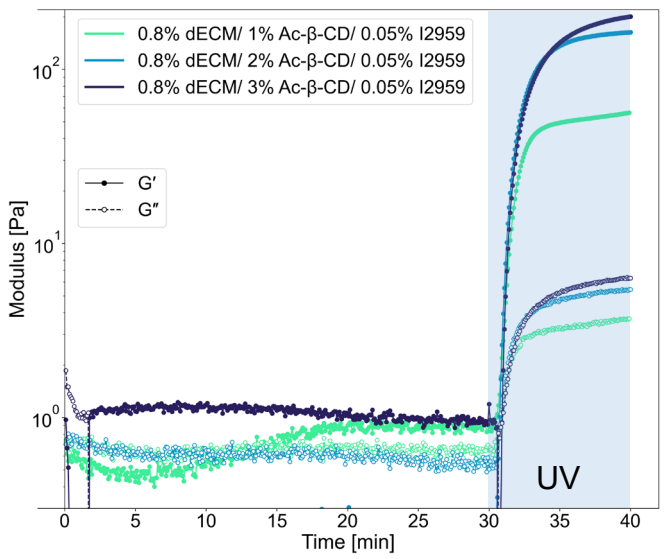
PROPOSED MECHANISM OF GELATION



RHEOLOGICAL CHARACTERIZATION



Thermal self-assembly is observed in both conditions. Subsequent photocrosslinking of Ac-β-CD in the formulation leads to an increased storage modulus compared to dECM alone.



Increasing Ac-β-CD concentrations modulate the thermal self-assembly of the dECM hydrogel. Photocrosslinked hydrogels with increasing Ac-β-CD concentrations show higher storage moduli.

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