A MINIMALIST DESIGN OF A "SELF-CLICK" HOST-GUEST MACROMER HYDROGEL ENABLING RAPID 3D CELL SPREADING

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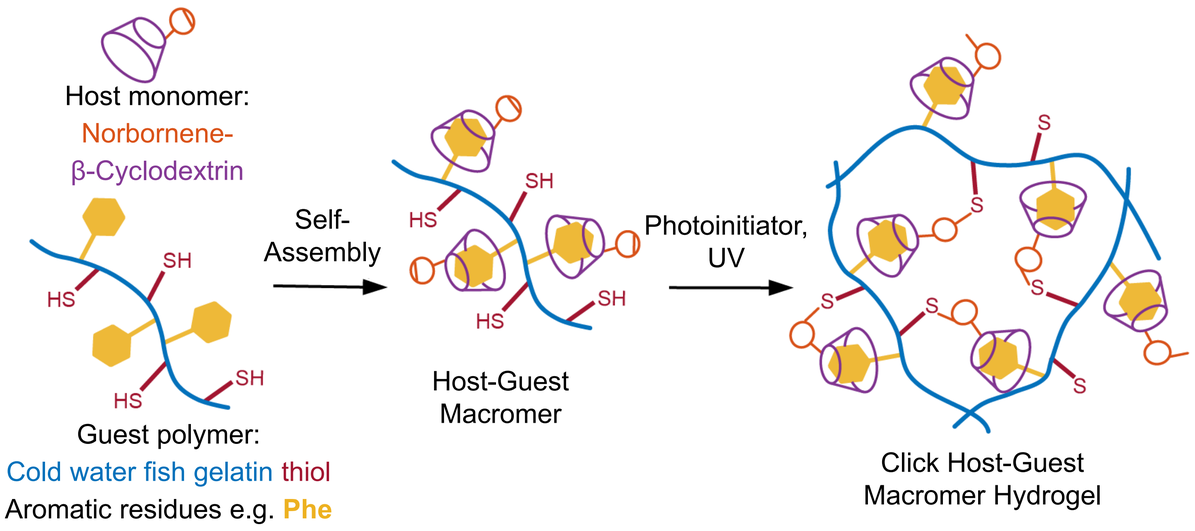
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INTRODUCTION

Gelatin is a biopolymer widely used in tissue engineering due to its intrinsic cell-interactive properties but needs modifications to form stable hydrogels in physiological conditions. The applied modifications often result in a static or inhomogeneous network structure restricting 3D cell spreading, migration, and subsequent cell activities crucial for tissue development and regeneration.[1]

Formulations to overcome these issues are often complex or slow curing, which limits their applications in 3D cell encapsulation and bioprinting.[2]

APPROACH

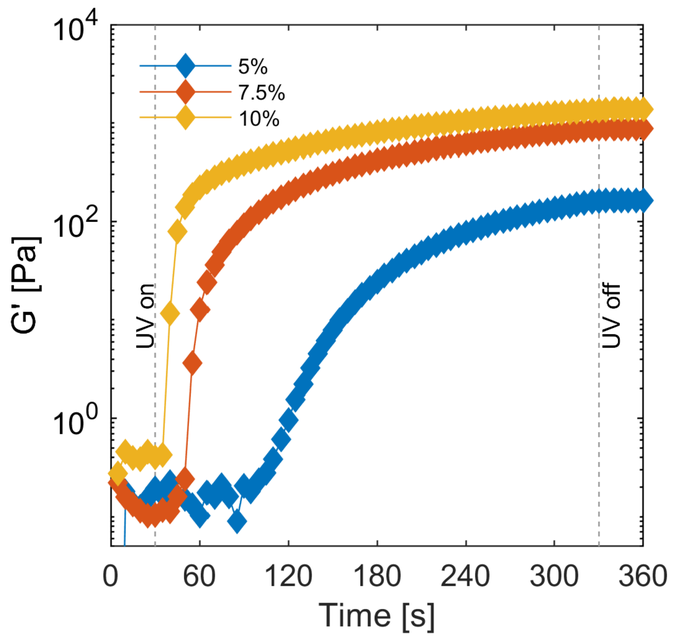


SUMMARY

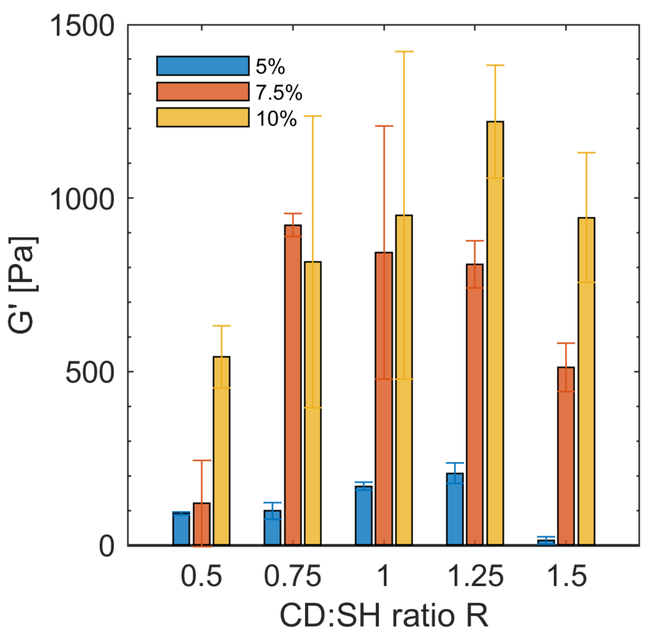
- Unusual swelling behaviour, higher swelling ratio at higher polymer concentration
- Fast cell spreading
- Minimalist molecular engineering approach, eliminating need for additional crosslinker or bioactive peptide conjugation

RESULTS

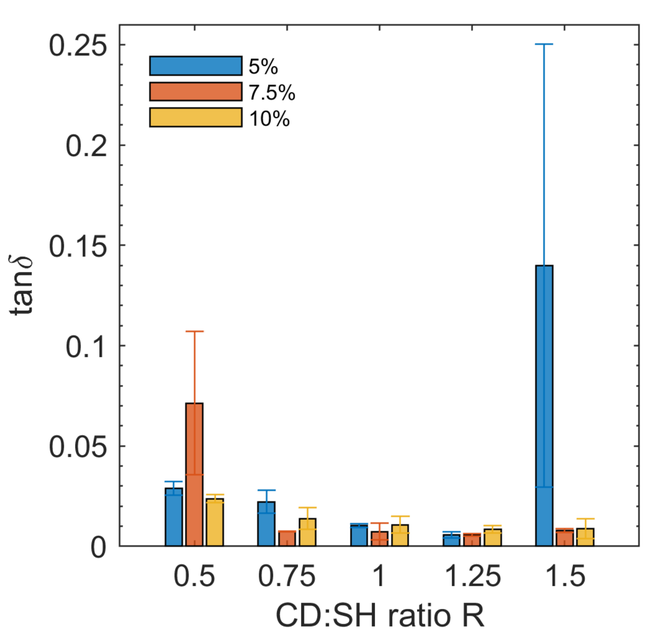
1. Gelation behavior and viscoelastic properties



UV-curing behavior of different cfGel-SH concentrations at CD:SH ratio R=1.25. Higher gelatin concentration results in faster crosslinking and increased G'.



Storage modulus G' of different hydrogel formulations after 5 min UV-curing. G' is maximised between R=1-1.25 and decreases at higher values.



Loss tangent tanδ is minimized between R=1-1.25. At higher R it increases again, indicating more liquid-like behavior and difficulties to form a gel.

2. Swelling behavior and mechanism

Formulations with higher gelatin concentration exhibit higher swelling ratios in physiological conditions. We explain this unusual behavior with the crosslink concentration increasing much less than the osmotic pressure increases.

3. Cell response

Our dynamic hydrogel shows comparable cytocompatibility as commonly used static gels but faster cell spreading and network formation of human dermal fibroblasts.

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2. Wei, K., et al., Macromolecules (2016) 49 (3), 866

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