

# Fabrication of mechanically robust PEG-based hydrogels for 3d printing and injection

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## Propositions

Accompanying the dissertation

### **Fabrication of Mechanically Robust PEG-Based Hydrogels for 3D Printing and Injection**

- 1- While perfection may not be completely attainable in our world, minimizing structural inhomogeneities and working towards a more ideal network can improve the macroscale properties of hydrogels, even if some defects remain.
- 2- *Lego* seems fun, but wait until you try Click Chemistry: it lets you bring molecules together simply, quickly, and precisely.
- 3- Replicating the mechanical properties and deformation behavior of load-bearing tissues with hydrogels remains a significant challenge in tissue engineering.
- 4- The biofabrication community requires continuous advancements in additive manufacturing technologies and bioinks to achieve the goal of repairing or regenerating damaged tissues in the operating room.
- 5- Using the same building blocks, the nucleophilic thiol-yne pathway, compared to the radical thiol-yne pathway, produces a more uniform network, resulting in better mechanical properties (**Chapter 3**).
- 6- The versatility of the thiol-yne and thiol-norbornene systems allows us to access the desired properties with a relatively simple plug and play approach that is widely accessible to non-experts in synthetic chemistry (**Chapters 3 and 4**).
- 7- The fast reaction kinetics and uniform nature of thiol-norbornene click chemistry enable us to process this system into robust and complex structures using volumetric printing in seconds (**Chapter 5**).
- 8- Interpenetrating networks formed by combining PEG and alginate networks delay crack propagation and enhance fracture energy (**Chapter 6**).
- 9- The era of volumetric printing has just begun. Its ability to enable fast fabrication combined with structural complexities and design freedom can revolutionize the field of biofabrication.
- 10- A PhD is a collection of failed experiments, long days, and late nights that makes you resilient, collaborative, a problem solver, a professional learner, and more.