Docket #: S16-344

Injectable and Stable Hydrogels with Dynamic Properties Modulated by Biocompatible Catalysts

Current injectable hydrogel materials have fast erosion and limited tunability of their mechanical properties at different stages of applications, limiting their biomedical applications. This invention overcomes these limitations by using biocompatible catalysts to modulate the exchange kinetics of dynamic hydrogels to provide high injectability and stability at different stages of cell delivery.
The hydrogels are formed through dynamic hydrazone bonds in the presence of a biocompatible catalyst. The catalyst accelerates the formation and exchange of hydrazone bonds, enhancing injectability and improving cell viability through injection to >80%, but rapidly diffuses out after injection to retard the exchange and improve the stability, thus providing long-term gel stability for cell culture. These injectable hydrogels are proved to protect cells during cell transplantation and 3D printing of cell cultures.

Figure

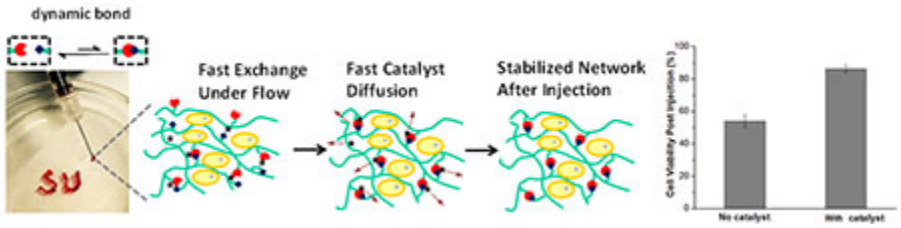


Figure description - A biocompatible hydrogel composition that is injectable, and has slow erosion and tunable mechanical properties, and protects cells during injection.

Stage of Research

- Prototype hydrogel composition showed high biocompatibility, good injectability and stability, and variable mechanical properties.

- Experiments consistently showed 85% cell viability after cell transportation using prototype hydrogel composition vs. 55% cell viability using control hydrogel composition.

Applications

- **Hydrogel applications:**
  - Cell transplantation
  - Tissue engineering
  - 3D printing of cell matrix

Advantages

- **Resolves current limitation of injectable hydrogels**
- Process produces desirable biocompatible, hydrogel properties:
  - Long-term stability
  - High injectability and cell protection
  - Tunable mechanical properties

Patents

- Published Application: 20180104348
- Issued: 10,220,096 (USA)

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