

Photopatterned Biomolecule Immobilization to Guide 3D Cell Fate in Natural Protein-Based Hydrogels

The technology is a method using photomediated oxime ligation to covalently decorate naturally derived hydrogels with bioactive proteins, such as growth factors, to spatially control encapsulated cell fate.

What is the Problem?

Natural protein-based hydrogel biomaterials are regularly used in three-dimensional (3D) cell culture and tissue engineering since they mimic many important aspects of native tissue while permitting matrix remodeling and biological integration. However, spatiotemporal control over cell fate within these natural biomaterials has not yet been demonstrated. As a result, there is a need to develop methods to direct complex cell fates in natural hydrogels.

What is the Solution?

The solution is a method using photomediated oxime ligation to covalently decorate naturally derived hydrogels with bioactive proteins, such as growth factors, to spatially control encapsulated cell fate. Photomediated oxime ligation enables user-defined control over when and where ligation occurs with high specificity, thus it is uniquely capable of spatiotemporally regulating cell function in natural protein-based hydrogels. With mask-based and laser-scanning lithographic activation of the photomediated oxime ligation, this method gives full 4D control over covalent protein immobilization within natural polymer-based hydrogels.

What is the Competitive Advantage?

The competitive advantage of this technology lies in its ability to spatially modify natural protein-based hydrogels with covalent protein immobilization in a highly specific manner. This greatly advances current abilities to recapitulate the dynamic biochemical heterogeneity characteristic to native tissues. As the global biomaterials market size is valued at \$155.1 billion in 2022 with an expected CAGR of 15.5%, there is a significant opportunity for this technology to advance the field of biomaterials.

Patent Information:

[WO2022140269](#)

Technology ID

BDP 8374

Category

Materials/Other

Research Tools

Selection of Available Technologies

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Learn more



References

1. Batalov, I., Stevens, K.R., DeForest, C.A.(2021) ,
<https://www.pnas.org/doi/10.1073/pnas.2014194118>, <https://www.pnas.org/> , 118,
e2014194118