

Methods to Improve Protein Functionalization of Polymer Scaffolds

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OVERVIEW

A method for preparing a polymer scaffold capable of reacting with biomolecules

- Controls the amount of functionality of the scaffold attached to proteins, peptides, or small molecules
- Allows delivery of immunoregulatory molecules, growth factors, and cell-binding domains

BACKGROUND

The purposeful delivery of proteins to cellular environments may be used to elicit desired responses from the cells. The attachment of proteins to polymer scaffolds represents an advantage in their over delivery other approaches, such as encapsulation. Current methods that functionalize polymer scaffolds involve post preparation modification of the polymer scaffold with proteins, peptides, or other small molecules. However, modification methods following polymer scaffold preparation are typically inefficient and inconsistent between batches. In particular, due to the porous nature of the polymer scaffolds, it is difficult for this approach to produce a homogeneous coating of proteins, peptides, or other small molecules. Thus, a need exists for polymer scaffolds that can improve upon the limitations inherent in the existing mechanisms for their production.

INNOVATION

Researchers have discovered a method of preparing a polymer scaffold including an admixture of a biotinylated reagent and a polymer. The reactive handle of the polymer is capable of reacting with a biomolecule to form either covalent or non-covalent bonds, providing control over the functionality of the scaffold. This biotinylated polymer creates conditions sufficient to

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form the polymer scaffold which can allow for the attachment a broad range of protein, peptides, or small molecules to the surface of the scaffold, permitting its use in a wide range of applications. Suitable polymers may include functional groups such as carboxylic acids, alcohols, aldehydes, amines, amides, esters, and combinations thereof.

This approach creates advantages such as providing a known quantity of reactive handles as well as permitting a means to purposely distribute them spatially throughout the polymer structure. Examples of applications related to this innovation include the provision of immunoregulatory molecules to protect transplanted tissue, the delivery of growth factors to stimulate growth, differentiation, or proliferation, and the presentation of cell binding domains to provide physical cues and adhesion.