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Advancing the Arizona State University Knowledge Enterprise

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Devices for High Throughput Manufacture of 3D Macroporous Polymeric Scaffolds

3D macroporous gels/polymeric monoliths are finding increased utility in many applications including plasmid DNA binding, tissue engineering, tumor modeling, 3D cell cultures and studies, and so on. However, creating these gels is cumbersome, requires technical skill and is limited to smaller quantities. There is a need to be able to easily create multiple kinds of these 3D gels, having superior properties, in high throughput but also in a cost effective manner.

Researchers at Arizona State University have developed simple devices for high throughput fabrication of user desired 3D macroporous hydrogel/polymeric monoliths. The devices were designed to create 3D gels in large quantities to assist with cell culture studies, bone tissue engineering, stem cell differentiation and novel substrates for plasmid DNA binding and recovery. The invention provides reliable, easy to use, simple device sets for generating 3D macroporous gels of multiple materials such as PLGA, polyacrylamide, PEGDA gels, aminoglycoside hydrogels, etc. in a parallel, high throughput format. These can also be employed for the discovery of novel macroporous materials.

Using these device sets, an entire new method of 3D macroporous hydrogel/polymeric monolith preparation is presented. With their simplicity, elegance and ease of use, there should be quick acceptance of these devices in the research world of tissue engineering, plasmid DNA chromatography, and more.

Potential Applications

- Creation of 3D macroporous gels/columns/monoliths:
  - Plasmid DNA chromatography
  - Bone/tissue engineering
  - 3D in-vitro models for cell culture/tumor dormancy
  - Stem cell differentiation substrates
  - And many more applications

Benefits and Advantages

- Relatively simple design
- Scalable/high throughput production capabilities
- Low cost and highly reusable
- Easy to use - may be fabricated and ready to use in a matter of minutes
- Reproducible
- The gels are easily extracted from the devices
- Devices can be made of any dimension and can generate different shapes (customizable)
- Ligands can be conjugated to the surface of the gels without unwanted intra-

monolith crosslinking

For more information about the inventor(s) and their research, please see Dr. Rege's directory webpageDr. Rege's laboratory webpage