A SHELLULAR MATERIAL AS TISSUE ENGINEERING SCAFFOLD

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A tissue engineering scaffold is a three-dimensional substrate which provides a viable environment for organ and tissue regeneration. A variety of biodegradable scaffolds have been introduced over the past decades. However, there are still several issues to be addressed in terms of non-blocking supply of nutrients and oxygen and even distribution of cell culture. In this work, we propose a polymer membrane architecture named Shellular as a scaffold or a bioreactor. The Shellular comprises two sub-volumes which are interwinded with each other and separated by a single continuous smooth semi-permeable membrane. One sub-volume is used for cell culture, while the other serves as mass transfer channel. This intriguing structure is expected to provide high permeability and sustainable porosity with large interfacial area thereby guaranteeing continuous nutrients and oxygen supply to the proliferating cells as well as the removal of waste through the thin semi-permeable membrane. In addition, the Shellular scaffold has biomorphic geometry similar to the triply periodic minimal surface (TPMS) that is ideal to facilitate cellular attachment and realize uniform cell culture. In this work, chitosan was chosen as the main substance of the membrane, and the fabrication process has been developed based on 3D UV photo-lithography. The mechanical properties, microstructure and permeability are examined.

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