10.1071/CHv58n10toc

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Scaffolds provide an environment for cells to attach, proliferate, and develop for tissue engineering applications. Learn more in the Review by Cooper-White et al. (p. 691) in this issue's Research Front.

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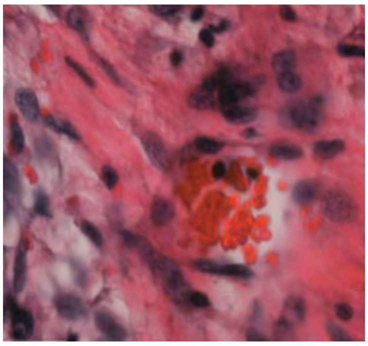
RESEARCH FRONT: Scaffolds, Stem Cells, and Tissue Engineering

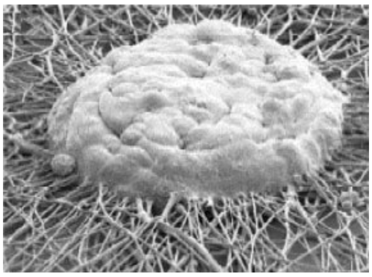
Essay

Whether creating tissues for therapeutic applications and replacement organs or exploring cell and developmental biology, stem cells within scaffolds represent a forefront of materials–medical research. The choices in cell type, physicochemical properties of the scaffold, and growth media make this a fertile research field, as introduced in this Essay.

Reviews

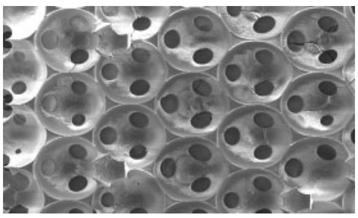


Tissue engineering promises to be a solution to tissue loss or failure. This generally involves the implantation of a 'seeded' polymeric scaffold into the site of repair or regeneration. The image shows blood vessels invading a scaffold in the early stages of the in vivo tissue regeneration. Stem cells are ideal cellular candidates as they have the inherent ability to differentiate into a wide range of tissues.



For tissue engineering applications, nanofibres can form the basis of a scaffold or barrier. Most advantageously, such nanofibres offer flexibility in preparation methods and material choices, which allow the cell–nanofibre–matrix interaction to be tuned as required. The image shows an example of such a tuning, in which hepatocytes are able to grow on and through a nanofibre mat.

Rapid Communications

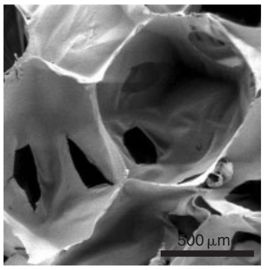


The effectiveness of inverted colloidal crystal (ICC) scaffolds for growing cells is affected by diffusion of cells and nutrients within the scaffold. A model for the interactions between cells and nutrients with the ICC scaffold has been developed. This model indicates a promising 'design landscape' of cavity radii and cavity–pore–cavity connections.

Processing Windows for Forming Silk Fibroin Biomaterials into a 3D Porous Matrix

Hyeon Joo Kim, Hyun Suk Kim, Akira Matsumoto, In-Joo Chin, Hyoung-Joon Jin, David L. Kaplan

Aust. J. Chem. **2005**, *58*, 716–720.



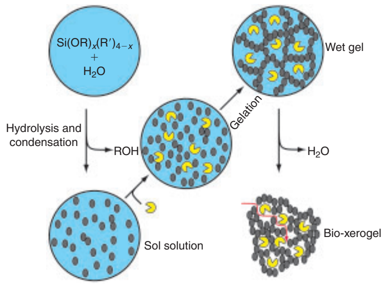
The combination of biocompatibility, slow degradability, processing versatility, options for genetic re-design, and exceptional mechanical properties places silk as an excellent source of protein-based polymeric biomaterials. Herein the processing space (solids content, solvent, porogen) to control the pore size and connectivity for silk proteins reprocessed into porous scaffolds is described.

Focus

Sweet Biofriendly Silicates

Gary A. Baker

Aust. J. Chem. **2005**, *58*, 721.



Biological items encapsulated or confined within glass is of interest for many applications, including artificial organs. Convention preparation of glass, in a furnace, is incompatible with biology. A sol–gel glass preparation method overcomes this restriction, providing, among others, covalently attached sugar–silicate materials.

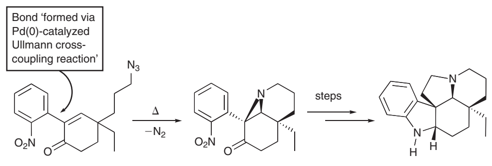
Full Papers

Application of the Palladium(0)-Catalyzed Ullmann Cross-Coupling Reaction in a Total Synthesis of (±)-Aspidospermidine and thus Representing an Approach to the Lower Hemisphere of the Binary Indole–Indoline Alkaloid Vinblastine

Martin G. Banwell, David W. Lupton, Anthony C. Willis

Aust. J. Chem. **2005**, *58*, 722–737.

The illustrated α-arylated cyclohexenone incorporating a tethered azide, and obtained via the title cross-coupling reaction, is converted into the ring-fused aziridine shown upon heating in benzene. The latter compound can be elaborated into the alkaloid (±)-aspidospermidine over a further six steps.

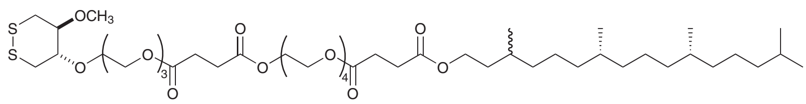


Synthesis and Characterization of SAMs and Tethered Bilayer Membranes from Unsymmetrically Substituted 1,2-Dithianes

Christopher J. Burns, Leslie D. Field, Brian J. Petteys, Damon D. Ridley

Aust. J. Chem. **2005**, *58*, 738–748.

The lipid shown and analogues were bound to a gold surface. The dithiane anchoring moiety provides two sulfur atoms per lipid molecule to create a strong dissociation- and phase separation-resistant bond. Tethered bilayer membranes derived from self-assembled monolayers formed from the lipids are a model for cellular membranes.



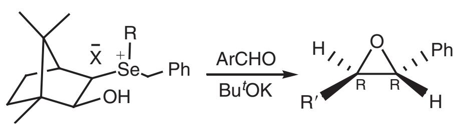
3

New Camphor-Derived Selenonium Ylides: Enantioselective Synthesis of Chiral Epoxides

Xin-Liang Li, Yi Wang, Zhi-Zhen Huang

Aust. J. Chem. **2005**, *58*, 749–752.

An optically pure selenonium salt can be synthesized stereoselectively in good yield. The reaction of the selenonium salt, an aldehyde, and potassium *tert*-butoxide can take place smoothly through selenonium ylide to give chiral *trans*-diaryl epoxides in good yields with good diastereoselectivities and high enantioselectivities.



Short Communication

Book Review