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Self-Assembled 3D Ordered Macroporous Structures for Tissue Engineering Scaffolds WEN-TAU JUAN, KUO-YUAN CHUNG, Institute of Physics, Academia Sinica, Taipei, Taiwan, NARAYAN MISHRA, Dept. of Paper Technology, Indian Institute of Technology, Roorkee, KENG-HUI LIN, Institute of Physics, Academia Sinica, Taipei, Taiwan — A simple, inexpensive and fast microfluidic method to fabricate three-dimensional ordered macroporous gel is demonstrated using alginate as the scaffold material. The microfluidic device consists of two concentric micropipettes where one is nested inside the other. Nitrogen gas and aqueous alginate solution with Pluronic F127 are pumped through the inner and the outer channel respectively. Under appropriate conditions, bubbles of a uniform size are generated within the device at few thousand Hz. We show the control over bubble size by the gas pressure and quantitatively predict the size dependence from the geometry of fluidic device. Monodisperse bubbles are collected and self-assemble into crystal structures as wet foam. The alginate solution between bubbles is crosslinked by divalent calcium ions and turns into 3D ordered macroporous gel where the pores are highly interconnected. The pore size can be directly controlled by the bubble size which ranges from few tens microns to few millimeters. This technique promises a versatile and robust way to make 3D ordered tissue engineering scaffolds.

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