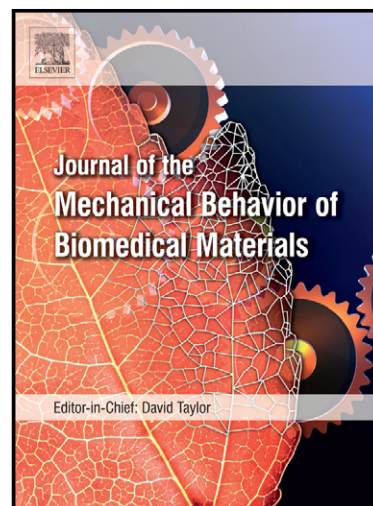


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## Relationship between micro-porosity, water permeability and mechanical behavior in scaffolds for cartilage engineering.

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### Abstract

In tissue engineering the design and optimization of biodegradable polymeric scaffolds with a 3D-structure is an important field. The porous scaffold provide the cells with an adequate biomechanical environment that allows mechanotransduction signals for cell differentiation and the scaffolds also protect the cells from initial compressive loading. The scaffold have interconnected macro pores that host the cells and newly formed tissue, while the pore walls should be micro-porous to transport nutrients and waste products. Polycaprolactone (PCL) scaffolds with a double micro- and macro-pore architecture have been proposed for cartilage regeneration. This work explores the influence of the micro-porosity of the pore walls on water permeability and scaffold compliance. A Poly(Vinyl Alcohol) with tailored mechanical properties has been used to simulate the growing cartilage tissue inside the scaffold pores. Unconfined and confined compression tests were performed to characterize both the water permeability and the mechanical response of scaffolds with varying size of micro-porosity while volume fraction of the macro pores remain constant. The stress relaxation tests show that the stress response of the scaffold/hydrogel construct is a synergic effect determined by the performance of the both components. This is interesting since it suggests that the in vivo outcome of the scaffold is not only dependent upon the material architecture but also the growing tissue inside the scaffold's pores. On the other hand, confined compression results show that

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