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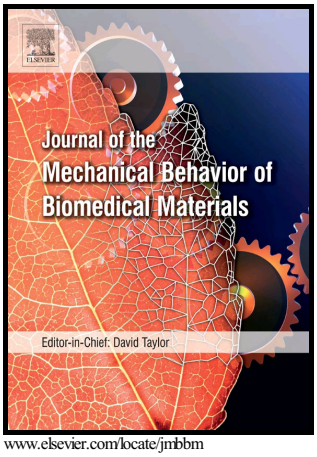

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Preventing collapsing of vascular scaffolds: the mechanical behavior of PLA/PCL composite structure prostheses during in vitro degradation

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ABSTRACT: The success of blood conduit replacement with synthetic graft is highly dependent on the architecture, and mechanical properties of the graft, especially for biodegradable grafts serving as scaffolds for in-situ tissue engineering. Particularly, the property of the radial compression recovery represents a critical to keep the patency during biointegration. Bi-component composite vascular grafts (cVG) made of polylactic acid (PLA) fabric and polycaprolactone (PCL) were developed with superior mechanical properties. In this research, the compressive and tensile properties of the prototypes were characterized when they were subjected to accelerated degradation. In addition, the prepared cVG were analyzed by scanning electron microscopy (SEM), differential scanning calorimetry (DSC), and wide angle X-ray diffraction (WAXD) to illustrate the gradual loss of mechanical properties. The results demonstrated that the cVG retained the circular cross-section even through its tensile strength decreased during degradation. The cVG samples containing a high percentage of PLA fibers lost their tensile strength faster, while the samples with lower PLA percentage lost the compressive resistance strength more quickly. This unique fabric-based composite biodegradable vascular prosthesis with an outstanding radical compression recovery could be a good candidate for in-situ formation of tissue engineered vascular graft.