

## **The preparation of co-continuous micro-porous PLLA scaffolds and their application for bone tissue regeneration**

Qingwei Zhang<sup>1,2,4</sup>, David M. Wootton<sup>3</sup>, Peter I. Lekes<sup>2,4</sup>, Jack G. Zhou<sup>1</sup>

<sup>1</sup>Dept. of Mechanical Engineering and Mechanics, Drexel University, Philadelphia, PA.  
Email: qzhang@coe.drexel.edu; <sup>2</sup>Drexel University College of Medicine, Philadelphia, USA. <sup>3</sup>Mechanical Engineering, Cooper Union, NY. <sup>4</sup>School of Biomedical Engineering, Drexel University, Philadelphia, PA, USA.

**Abstract:** Bone surgery is a major health concern world-wide due to the large aging population and increased occurrence of sport-related damage. A series of novel poly-L-lactic acid (PLLA) scaffolds with micro-porous structure were prepared by injection molding an immiscible polymer blend. The morphology of the produced scaffolds was observed under SEM, which shows a co-continuous micro-porous structure was successfully created. The cytotoxicity of produced micro-porous structural PLLA scaffolds was tested with culturing murine osteoblasts cell line (7F2) on scaffolds for up to 9 days; the cell morphology was assessed by fluorescent nuclear staining with Hoechst 33258. In order to evaluate the functional and cell biological applicability of the

micro-porous structural PLLA scaffolds, a subcutaneous biodegradation test was performed through rat model for 1 week and 1 month time period, respectively. Our results showed that the micro-porous structural PLLA scaffolds are non-toxic, and they showed a mild foreign body reaction and complete fibrous encapsulation after implantation. Well created interconnected porous structure and biocompatibility suggest great potential of the micro-porous PLLA scaffolds in application for inducing and sustaining bone tissue repair.

**Key Words:** Co-continuous; Micro-porous; PLLA; Bone; Tissue Engineering