

Computer-Aided Tissue Engineering and Its Application for Freeform Fabrication of Tissue Substitutes

Wei Sun, Drexel University, Philadelphia, Pennsylvania, USA

Abstract

Advances in modern design and manufacturing, biomaterials, biology and biomedicine have emerged a new field of Computer-Aided Tissue Engineering (CATE). CATE enables the application of advanced computer-aided technologies and biomechanical engineering principles to derive systematic solutions for complex tissue engineering problems. This presentation will report our recent research on CATE, including its overview and the three major application fields: 1) computer-aided tissue modeling; 2) computer-aided tissue scaffold informatics and biomimetic design, and 3) the informatics model driven digital fabrication for tissue engineering. The development of proprietary Precision Extruding Deposition (PED) process and the multi-nozzle biopolymer deposition process for freeform fabrication of tissue scaffolds and cell seeded tissue precursors will be presented. Fabrication of scaffolds by different biomaterials, including alginate, Polycapro-

lactone (PCL), PCL/alginate and PCL/Hydroxyapatite (HA) composites will be introduced. Results and characterizations of scaffold under different processes and the effect of the process parameters on the scaffold structural, mechanical and biological properties will also be presented.

Author Biography

Wei Sun, Ph.D., is currently appointed as Associate Professor at the Department of Mechanical Engineering and Mechanics, Drexel University. Sun's research and education interests are in the areas of Computer-Aided Tissue Engineering, Design and Manufacturing, CAD/CAM and Solid Freeform Fabrication. Sun has published over 120 technical papers. Sun is currently elected as section editor for Tissue Engineering for International Journal of American Society for Artificial Internal Organs (ASAIO).