Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Investigation of polymeric scaffold degradation for drug delivery and neovascularization applications[1] KARTIK V. BULUSU, MITRA ALIBOUZAR, NATHAN J. CASTRO, LIJIE G. ZHANG, KAUSIK SARKAR, MICHAEL W. PLESNIAK, George Washington University — Degradable polymer-based prosthetics for the treatment of osseous tissue defects, maxillo-/cranio-facial trauma and brain injury face two common clinical obstacles impeding efficient tissue engraftment i.e., controlled material release and neovascularization. Ascertaining the time scales of polymer degradation for controlled delivery of drugs and nutrients is critical to treatment efficacy and strategy. We incorporated multiple experimental methodologies to understand the driving forces of transport mechanisms in polyvinyl alcohol-based (PVA) 3D-printed scaffolds of different porosity. Scaffold degradation was monitored various pulsatile flow conditions using MEMS-based pressure catheters and an ultrasonic flow rate sensor. Ultrasonic properties (bulk attenuation and sound velocity) were measured to monitor the degradation process in a static, alkaline medium. Viscosity and the absorption spectra variations with PVA-solute concentrations were measured using a rheometer and a spectrophotometer, respectively. A simple mathematical model based on Ficks law of diffusion provides the fundamental description of solute transport from the scaffold matrices. However, macroscopic material release could become anomalous or non-Fickian in complex polymeric scaffold matrices.

[1]Supported by the GW Center for Biomimetics and Bioinspired Engineering and NIH Directors New Innovator Award 1DP2EB020549-01.

Michael Plesniak
George Washington University

Date submitted: 01 Aug 2016 Electronic form version 1.4