Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Block Copolymer Directed Biomimetic Mineral Formation for Polymer Nanocomposites SARAH GLEESON, TONY YU, XI CHEN, MICHELE MARCOLONGO, CHRISTOPHER LI, Drexel University — Bone is a hierarchically structured biocomposite comprised of mineralized collagen fibrils. The mechanical properties of bone can be precisely tuned by the structure and morphology of the mineral nanocrystals as well as the organic collagen fibrils. Synthetic materials that can mimic the nanostructure of natural bone show promise to replicate bone's structural function, yet little is known about the mechanism of mineral formation. We previously have shown that hierarchically ordered polymer fibers control the distribution and orientation of hydroxyapatite, enhancing mechanical properties and biocompatibility. We demonstrate a new method for mineralization by forming block copolymer single crystal films of polycaprolactone-*block*-poly(acrylic acid) (PCL-*b*-PAA) so that lamellar anionic PAA nanodomains recruit mineral ions and provide one-dimensional confinement to induce orientation. The effect of the anionic domain dimensions on mineral content, orientation, and structure within the polymer matrix is shown. The mechanical properties of the nanocomposite are evaluated to determine the role of mineral orientation and crystallinity in composite strength. These results can be used to tailor the physical mineralization environment to create a more biomimetic bone material.

Sarah Gleeson
Drexel University

Date submitted: 11 Nov 2016 Electronic form version 1.4