Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

The role of polyelectrolytes in the stabilization of calcium phosphate nanoparticles for the production of biomimetic materials DANIEL KROGSTAD, DONGBO WANG, SHENG LIN-GIBSON, NIST - Natl Inst of Stds & Tech — The exceptional mechanical properties of bone are a result of the hierarchical assembly of hydroxyapatite and the bone matrix, which is primarily composed of collagen. However, it has been shown that without highly acidic, non-collagenous proteins (NCP), which comprise only a few percent of the total organic material, collagen cannot be mineralized correctly. Although the exact roles of these NCP are unknown, it is believed that they are responsible for the stabilization and transportation of the apatite precursor, amorphous calcium phosphate (ACP). In this work, polyaspartic acid was used as a synthetic analog for NCP and the structure and kinetics of calcium phosphate nanoparticle formation were determined at various concentrations using cryo-TEM and scattering. From this investigation, it was determined that the size and stability of the ACP nanoparticles could be directly controlled by the relative ion and polymer concentrations. Interestingly, at high polymer concentrations, the particles remained suspended in solution even after they transformed from ACP to apatite indicating that the polymers have a strong ability to prevent particle aggregation. Through these results, control over the particle size and stability has been increased which will help in the design and development of biomimetic materials.

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Date submitted: 15 Nov 2013 Electronic form version 1.4