Abstract Submitted
for the OSF12 Meeting of
The American Physical Society

Controlled RGD Peptide Adsorption on Aggregation-Free, Size-Selected Hydroxyapatite Nanoparticle Substrates PARIMAL BAPAT, Department of Physics, University of Alabama at Birmingham, U.S.A, BONNIE CULPEPPER, Department of Biomedical Engineering, University of Alabama at Birmingham, SUSAN BELLIS, Department of Cell, Developmental and Integrative Biology, University of Alabama at Birmingham, RENATO CAMATA, Department of Physics, University of Alabama at Birmingham — Numerous studies of cell attachment, differentiation, and proliferation have been carried out on nanostructured hydroxyapatite (HA) surfaces with cell adhesive peptides containing the RGD (Arg-Gly-Asp) motif. Although these studies have yielded useful insights into the role of RGD peptides in cell-HA biomaterial interactions, the heterogeneity of typical nanophase HA materials makes it difficult to decouple the effects of nanotopography and biochemical cues. In this work we have used aggregation-free, size-controlled HA nanoparticles with mean size in the 20-70 nm range, synthesized by gas-phase laser ablation and deposited on atomically flat bioinert substrates that may help overcome this challenge. Nanoparticle deposits with adjustable number concentration were characterized by transmission electron microscopy, atomic force microscopy, and X-ray diffraction. RGD peptides modified by the addition of a polyglutamate sequence and a fluorescent conjugate, were coated onto the HA nanoparticle substrates. Intensity histograms of fluorescent microscopy images show that peptide adsorption on the substrates scales with the concentration of HA nanoparticles. High HA nanoparticle concentrations also lead to peptide clustering tunable in the 100-1200 cm^{-2}.

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Date submitted: 17 Sep 2012 Electronic form version 1.4