NT-P003

Hybrids of Au nanodishes and Au nanoparticles

Jin Gyeong Son[1,2], Sang Woo Han[2], Tae Geol Lee[1], Jung-Sub Wi[1]

[1]Center for Nano-Bio Measuremnet, Korea Research Institute of Standards and Science, Daejeon,305-340, Korea
[2]Department of Chemistry, Korea Advanced Institute of Science and Technology, Daejeon, 305-070, Korea

We demonstrate a simple route to hybridize two different nanomaterials by using three-dimensional nanodishes that can be used as small plasmonic containers to host guest nanoparticles. Our nanodishes were fabricated using nanoimprint lithography and oblique-angle film deposition, and the guest nanoparticles were drop-casted onto the host nanodishes. Based on the proposed method, colloidal Au nanoparticles were assembled inside Au nanodishes in the form of a labyrinth. These Au nanoparticle–nanodish hybrids excited a strong surface plasmon resonance, as verified by a numerical simulation of the local field enhancement and by direct observation of the enhanced Raman signals. Our results point to the potential of the nanodishes as a useful platform for combining diverse nanomaterials and their functionalities.

Keywords: Nanodishes, Nanoparticles, Nanoimprint, SERS

NT-P004

Analysis of calcium phosphate nanoclusters using the TOF-MEIS

Kang-Won Jung[1], Jimin Park[2,3], Ki Dong Yang[2], Ki Tae Nam[2], DaeWon Moon[1*]

[1]Department of New Biology, DGIST, Dalseong, Daegu, 711-873, Republic of Korea
[2]Department of Materials Science and Engineering, Seoul National University, Seoul 151-744, Republic of Korea
[3]Center for Biomaterials, Korea Institute of Science & Technology, Seoul 136-650, Republic of Korea

We have developed a TOF-MEIS system using 70~100 keV He+. A TOF-MEIS system was designed and constructed to minimize the ion beam damage effect by utilizing a pulsed ion beam with a pulse width < 1 ns and a TOF delay-line-detector with an 120 mm diameter and a time resolution of 180 ps. The TOF-MEIS is an useful tool for interfacial analysis of the composition and structure of nano and bio systems. Our recent applications are reported. We investigated the effect with Polyaspartic Acid (pAsp) and Osteocalcin on the initial bone growth of calcium hydroxyl appatite on a carboxyl terminated surface. When pAsp is not added to the self-assembled monolayers of Ca 2mM with Phosphate 1.2 mM, the growth procedure of calcium hydroxyl appatite cannot be monitored due to its rapid growth. When pAsp is added to the SAMs, the initial grow stage of the Ca-P can be monitored so that the chemical composition and their nucleus size can be analyzed. Firstly discovered the existence of 1-nm-sized abnormal calcium-rich clusters (Ca/P ~ 3) comprised of three calcium ions and one phosphate ion. First-principles studies demonstrated that the clusters can be stabilized through the passivation of the non-collagenous-protein mimicking carboxyl-ligands, and it progressively changes their compositional ratio toward that of a bulk phase (Ca/P~1.67) with a concurrent increase in their size to ~2 nm. Moreover, we found that the stoichiometry of the clusters and their growth behavior can be directed by the surrounding proteins, such as osteocalcin.

Keywords: TOF-MEIS,Calcium Phosphate, CaP