# DEVELOPMENT AND BIO-ELECTROCHEMICAL CHARACTERIZATION OF NOVEL NANO COMPOSITE COATINGS SUITABLE FOR ORTHOPAEDIC IMPLANTS

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The search for potential solutions to bone tissue problems exerts a strong demand for materials capable of substituting or repairing bones. Much attention is paid to biomimetic synthesis because it can prepare nanosized apatite crystals with controllable size.

$Fe_2O_3$-$TiO_2$ interlayered HAp (Hydroxyapatite) coating on SS had higher, adhesive strength than that of plain SS. The $Fe_2O_3$-$TiO_2$ interlayered HAp coating on SS was found to have least anodic polarization tendency during electrochemical activation studies in physiological solutions and they can withstand a current density of 150 mA/cm$^2$. Biomimetic growth study in Kokubo's 1.5SBF solution showed that the $Fe_2O_3$-$TiO_2$ interlayered HAp coating on SS enhanced further apatite growth; convinced from surface potential measurement, surface morphology of the HAp coating.

An increased apatite forming ability for the NaOH, $CaCl_2$ and heat treated Ti than NaOH and heat treated Ti on the surfaces was confirmed by the Scanning Electron Microscope (SEM), Energy Dispersive Spectrometer (EDS), the X-Ray Diffraction (XRD), and the Fourier Transform Infrared Spectrometer (FTIR) analysis. Thus, the treated Ti is expected to form bone-like apatite on its surface, even in the living body, and bond to living bone. On the basis of the results from EDS analysis after soaking in SBF for 20 days, the NaOH, $CaCl_2$ and heat treated Ti exhibited very intensive peaks of Ca and P than NaOH and heat treated Ti. Moreover, the intensity of substrate decreased due to interference from calcium phosphate deposits. The NaOH, $CaCl_2$ and heat treated Ti can be anticipated to be promising artificial bone substitutes or other hard tissue replacement materials for heavy load-

bearing applications due to their wonderful combination of bioactivity, low elastic modulus and low processing costs.

An increased apatite forming ability for the NaOH-heat treated Ti after immersion in SBF modified with calcium supplements than NaOH and heat treated Ti, was confirmed by the Scanning Electron Microscope (SEM), Energy Dispersive Spectrometer (EDS), the X-Ray Diffraction (XRD), and the Fourier Transform Infrared Spectrometer (FTIR) analysis. Thus, the treated Ti is expected to form bone-like apatite on its surface, even in the living body, and bond to living bone. On the basis of the results from EDS analysis after soaking in modified SBF containing calcium gluconate, calcium nitrate and calcium carbonate, were found to have very intensive peaks of Ca and P than the SBF modified with calcium acetate, calcium lactate. Moreover, the intensity of substrate decreased due to interference from calcium phosphate deposits. The calcium gluconate, calcium nitrate and calcium carbonate, can be anticipated to be the best calcium supplements for preventing osteoporosis.

***Keywords:*** *Biomimetic growth, Kokubo's 1.5SBF solution, Artificial bone substitutes, Scanning Electron Microscope (SEM), Energy Dispersive Spectrometer (EDS), the X-Ray Diffraction (XRD), and the Fourier Transform Infrared Spectrometer (FTIR) analysis.*

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