Combination of superhydrophilc surface and chemically bindable surface for enhancing bone differentiation

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Introduction
Purpose of our research is to improve cell attachment, differentiation and to induce rapid osseointegration of dental implant by using the deposition of uniform functionalized polymer nano-layer on titanium implant via initiated chemical vapor deposition (iCVD). Furthermore, We would attempt to introduce elastic layers to dental implants to absorb external stress and prevent perimplantitis by introducing functional polymer layers.

Materials and Methods
After increasing the surface roughness of Titanium disk (diameter: 12 mm, thickness: 1 mm) by using the anodization treatment, uniform functionalized-polymer nano-layer was deposited by iCVD. In this research, 100 nm of Glycydyl methacrylate (GMA) including epoxy group was deposited for the enhancement of the cell attachment. Samples were prepared as (1) only anodized samples (ANOD), fully GMA-coated samples (GMA-full) and dot-patterned GAM-coated samples (GMA-dot). These samples were tested in vitro IR spectroscopy, scanning electron microscopy (SEM) and contact angle measurement were measured to investigate surface characterization of the samples. For in vitro cellular response and cell experiment, adipose derived stem cells were used. In vitro cellular response included protein adsorption assay, live & dead assay, cell proliferation assay, alkaline phosphate activity assay and alizarin red staining assay.

Results
GMA-full shows a high protein adsorption ratio and GMA-full and GMA-dot show meaningful values at alkaline phosphate activity assay and alizarin red staining assay. Especially, at alkaline phosphate activity assay, GMA-dot shows a remarkable value.

Discussion and Conclusions
Our in vitro experiment shows that GMA-deposited samples with iCVD reveal better performances than non treated samples. Polymer depositing technology employing iCVD is expected to bring huge possibilities on cell attachment and differentiation. Furthermore, it could lead us to form elastic layers on dental implants and prevent perimplantitis.