strengths improved obviously. The macroscopic and histological observation of animal experiments displayed that the composites implant combined tightly with ambient tissues, and some bone-like tissue grew into the bottom of the implants from the base bone to form more deep-set binding. This study is supported by the Royal Society-NSFC international joint project (51111130207) and Beijing Municipal Sci. and Tech. Plan Project (Z111103066611005)

31.P04
Determination of motility of human pluripotent stem cells on various substrates

S Jin, K Peterson and K Ye
University of Arkansas, USA

The self-renewal of human embryonic and induced pluripotent stem cell (hESC/iPSC) require specific niches that have not yet been completely understood. In particular, the machinery underlying hESC/iPSCs' response to physicochemical cues provided by a substrate to which cells attach and spread remains largely elusive. We characterized the attachment and spread of hESC/iPSC on various types of substrates in response to physicochemical cues. The substrates that we tested include ECM and synthetic peptide coated flat or porous membrane substrates. The time-lapse imaging microscopy technique was used to quantify the trajectory and velocity of hESC/iPSC colony movement on these substrates. Many microspikes were observed from these colonies, driving the colonies to moving around vigorously on the TCP. The length of the micorspikes formed on peripheral of hESC colonies was approximately $10.91 \pm 3.96\ \mu$m in average, while it was $10.08 \pm 5.67\mu$m on iPSCs. Furthermore, about 70% more microspikes were observed on hESCs colonies, indicating high motility of hESCs, as compared to iPSCs. Furthermore, compared to the motility of hESC/iPSC colonies formed on Matrigel coated TCPs, cell colonies move much slower on synthetic peptide coated TCPs. Although hESC/iPSC proliferated in a similar rate, the motility of cell colonies was remarkably different. These studies suggested that the motility of cell colonies on substrates is adjusted by the physiological cues provided by the substrates.

31.P05
Engineered alkaline phosphatase with improved functionality immobilized on bone implant surfaces

PY Tian, LT de Jonge, H Autefage, AE Cass and MM Stevens
Department Of Materials, Imperial College London, UK; Department Of Chemistry, Imperial College London, UK

Titanium (Ti) implants are widely used to replace damaged or diseased bone because of their good mechanical properties and biocompatibility [1]. In order to obtain a rigid implant fixation in the surrounding bone tissue, Ti implant surfaces have been modified with the enzyme alkaline phosphatase (ALP). Since ALP increases the local inorganic phosphate concentration required for physiological mineralization of hard tissues, ALP coatings enabled enzyme-mediated mineralization onto implant surfaces [2]. This study aimed at developing advanced ALP coatings with improved functionality by enhancing the catalytic activity of ALP. A mutant ALP produced from a genetically engineered E.coli strain was shown to be 20 times more active than the wild-type (wt) ALP [3]. Both mutant and wt ALPs were immobilized on Ti to form functionally active coatings. The biological response was evaluated using both *in vitro* soaking and cell culture experiments. This study demonstrated that the engineered ALP was successfully deposited on Ti surfaces while maintaining its high activity; both wt and mutant ALP coatings accelerated mineralization as compared to non-coated Ti implants. Particularly, significantly more mineral was formed on the mutant ALP coatings. To summarize, these novel engineered ALP coatings hold promise for an early and strong anchoring of Ti implants in bone.[1] Stevens et al., SCIENCE, 2005.[2] de Jonge et al., ADV FUNCT MATER, 2009.[3] Xu et al., BIOCATAL BIOTRANSFOR, 2003.

31.P06
Mussel-inspired functionalization of metal surfaces with bioactive self-assembled peptide nanofibers

H Ceylan, S Kocabey, MO Guler and AB Tekinay
National Nanotechnology Research Center, Turkey

Implant surfaces, e.g., cardiovascular stents and orthopedic supports, need to be functionalized with bioactive cues so that they could promote rapid regeneration of the native tissue surrounding them. For example, rapid endothelialization over the stent surface plays an indispensible role in preventing restenosis and in-stent thrombosis for the long-term treatment of the cardiovascular diseases. Likewise, successful osseointegration in dental and orthopedic implants highly depends on the proliferation and migration of mineral deposing cells on the implant site. In this work, we developed bioactive peptide nanofibers which were conjugated with bioactive peptide sequences, REDV (endothelial-specific adhesion motif), KRSR (osteoblast-specific adhesion motif), and mussel-inspired adhesive molecule, 3,4-dihydroxy-L-phenylalanine (Dopa). These nanofibers mimic the structure and function of the native tissue extracellular matrix and could be attached onto metal surfaces through Dopa-mediated adhesion. We analysed endothelial and smooth muscle cells on REDV/Dopa nanofiber-functionalized steel substrates and osteoblast and fibroblast cells on KRSR/Dopa nanofiber-functionalized TiAl6V4 substrates. *In vitro* results demonstrated that endothelial cells and osteoblasts could specifically adhered, spread, and proliferated on REDV/Dopa and KRSR/Dopa nanofibers, respectively. The growth of smooth muscle cells and fibroblasts, however, was inhibited on these bioselective nanofibers.

31.P07
Development of instructive scaffolds for tissue engineering using ureido-pyrimidinone polymers

GC van Almen, AW Bosman and PYW Dankers
Laboratory of Chemical Biology, Department of Biomedical Engineering, and Institute for Complex Molecular Systems, Eindhoven University of Technology, the Netherlands; SupraPolix, Eindhoven University of Technology, the Netherlands

Supramolecular polymers are highly suitable as core-material in tissue engineering due to their molecular dynamics that resemble the plasticity of the native extracellular matrix (ECM). Functionalization of polymers and ECM-derived peptides with ureido-pyrimidinone (UPy) moieties enables the incorporation of instructive peptide motifs into a supramolecular scaffold. This allows the design of an intelligent biomaterial in which mechanical properties and biological cues can be tuned towards its specific requirements as a biomaterial via a 'mix-and-match'-principle. The current study explores the biomaterial properties of two polycaprolactone (PCL)-based polymers: bifunctional UPy-modified PCL (PCLdiUPy) and multifunctional chain-extended UPy-PCL (CE-UPy-PCL). To prevent protein adsorption and random cell adhesion both polymers were mixed with UPy-poly(ethylene glycol) (PEGdiUPy) that renders the surface antifouling. Whereas 30% PEGdiUPy is needed to add antifouling properties to PCLdiUPy, 10% is sufficient to prevent adhesion of 3T3 fibroblasts to CE-UPy-PCL surfaces. Next, surfaces coated with the UPy-functionalized RGD-motif were shown to promote cell adhesion and introduction of this fibronectin-derived pep-