Nanoscale Properties of Implantable Biomaterials

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Modifying the nanoscale structure/chemistry of materials allows to tailor and optimize their properties [1]. Our strategy rests on creating nanopatterns that act as surface cues [2,3] and affect cell behavior. We developed a chemical treatment of Ti-based materials that produces a unique nanostructured topography [4], showing that chemical oxidation is a general strategy that affects biocompatibility [5]. Our treatment generates multifunctional surfaces that promotes the growth of certain cells while inhibiting that of others, without using any growth factors. Nanostructured Ti surfaces selectively inhibit fibroblastic cell growth [4] and promote osteogenic cell activity [6] *in vitro*. Controling nanoscale features and functionalizing surfaces with molecular overlayers [7] will lead to a new generation of intelligent biomaterials that selectively influence cell behavior at the tissue-biomaterial interface, for example by controlling the adsorption of proteins [9]. Further enhancement of mechano-biocompatibility may be provided by coating with spider silk, whose structural/functional properties are currently being studied [10, 11].

References

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