Surface modifications of titanium and titanium alloys to improve their properties for biomedical applications

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Although the excellent biocompatibility and favorable mechanical properties of titanium and its alloys made them the materials of choice for the replacement of hard tissues such as teeth and bones, titanium-based implants are often subject to complications such as loosening of the implant-host interface due to unsatisfactory cell adhesion and susceptibility of implants to bacterial infections. By suitably manipulating the surface properties of these materials, through coatings or functionalization, it is possible to improve their cell-host response while inhibiting pathogenic microbial adhesion. The present work aims to pursue this result through the realization of an inorganic Cerium based coating on a layer of TiO2 nanotubes and through the functionalization of titanium surfaces with Poly[2-(Dimethylamino)ethyl Methacrylate] (PDMAEMA), a quaternizable, antibacterial and antifouling polymer.