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Multifunctional coatings for biomedical applications: challenges and problems

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The increasing demand for sustainable products requires the development of new knowledge-based materials with advanced properties. These products are then expected to: last longer, have a better performance, be safe, and be more efficient. These requirements, which maybe seen as a rule of thumb for most known materials, gain particular importance when dealing with applications involving the human body: the so-called biomaterials. The materials used in medical devices are subjected to high stresses and high regular endeavour. This very demanding situation associated with aggressive body fluids induces premature failure of the implants whichever material they are made, metallic, polymeric or ceramic. The fatigue wear process causes the generation of wear debris which, by acute host-tissue reactions tend to aggravate and speed up the failure of the biomaterial. Also orthopaedic devices as well as catheters and urethral stents have sometimes to be the physically removed due to microbial colonization. However, these problems could be resolved with the development of new biomaterials and especially new multifunctional-coatings. Multifunctionality is the result of a synergy, on the nanoscale level, of the beneficial properties of metal oxides (good corrosion properties) and carbides/nitrides (mechanical and tribological properties) resulting on newly synthesised oxycarbide and oxynitride coatings. On this talk some new results concerning the development of multifunctional coatings to apply on biomaterials, with improved physical, mechanical, tribological and also with the ability to prevent microbial adhesion and biofilm formation on these biomaterials will be presented and discussed.

Keywords

sputtering

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