

Surface nanofunctionalization for biomedical applications

Sandra Carvalho^{1,2*}

¹GRF-CFUM, University of Minho Physics Department, 4800-058 Guimarães, Portugal

² SEG-CEMUC, Mechanical Engineering Department, University of Coimbra, 3030-788 Coimbra, Portugal

sandra.carvalho@fisica.uminho.pt

With the increase of elderly population and health problems that are arising nowadays, as cancer, dental, knee and hip joint prostheses are being widely used worldwide. Thus, it is of major importance to develop new biomaterials and/or new coatings which will confer to biomedical implants improved physical, mechanical, tribological and biological performance as well as development of smart prosthesis, implantable biosensors. By keeping the existing knowledge on a variety of materials such as metals, ceramics, polymers and composites, used for total hip prosthesis or dental implants, the tendency in this biomedical field for achieving higher efficiency has been, more and more, to focus the attention on their surface by developing protective thin-films with biological activity or smart materials for sensors and actuators applications in the biomedical field. This approach is integrated in the recent interest on the so-called *bioactive coatings* materials from both the fundamental scientific viewpoint and in terms of Industrial applications.

In this presentation, results of bioactive coatings, deposited by reactive magnetron sputtering and after submitted to a nanofunctionalization, aimed for medical applications will be present. Fundamental aspects on multifunctional coatings will be analysed and discussed, such as (i) How the structural arrangements (nanocrystalline phases versus amorphous phases or hard phases versus soft phases) can control the final properties; (ii) How the coating surface nanostructures can improve the antimicrobial activity; (iii) How the surface topography and surface chemistry induces osteogenesis (iv) How can the surface functionalization promote osseointegration.