

Biomaterials Surface Integrity

Nicolas Lebon ^{1,2,*}  and Laurent Tapie ^{1,2} 

¹ Unité de Recherche en Biomatériaux Innovant et Interfaces-UR 4462, Université Sorbonne Paris Nord, 93000 Bobigny, France; laurent.tapie@u-paris.fr

² Prosthodontic & Biomaterials Departments, Université Paris Cité, 92120 Montrouge, France

* Correspondence: lebon@sorbonne-paris-nord.fr; Tel.: +33-(1)-58-07-67-85

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Nowadays, prostheses or implantable medical devices intended for biomedical use are manufactured using various processes, such as machining, 3D printing, molding, and forging. These manufacturing processes generate a characteristic “imprint” on the prosthesis shape called surface integrity. Regarding the functional requirements of prostheses or implantable medical devices, the concept of surface integrity represents a new and preferential approach to characterizing the surface and sub-surface properties of biomaterials. Surface integrity analysis provides a comprehensive evaluation of the surface and its impact on the prosthesis’ performance. However, the integrity of the surface, which must be suitable to meet expected clinical requirements (mechanical properties, optical properties, thermal properties, electrical properties, chemical properties), is influenced by the manufacturing process parameters used. To assess surface integrity, many characterization techniques are available depending on the observation scales; these include, but are not limited to, spectroscopy, optical imaging methods, nanoindentation, magnetic property measurements, roughness measurements, and X-Ray inspection. Surface integrity is a fundamental concept in engineering due to the invaluable source of information it provides about surface characteristics and its ability to meet clinical functional specifications.

This Special Issue is made up of four articles.

The first article, entitled “Milled Surface Integrity: Application to Fixed Dental Prosthesis”, details and transposes the concept of surface integrity to dentistry and oral science [1]. This review presents the main components of surface integrity, and their correlations within the triptych of surface-integrity–process–clinical functionalities are presented.

The second and the third articles—respectively named “The Effect of Threads Geometry on Insertion Torque (IT) and Periotest Implant Primary Stability: A High-Density Polyurethane Simulation for the Anterior Mandible” and “Influence of Anodized Titanium Surfaces on the Behavior of Gingival Cells in Contact with: A Systematic Review of In Vitro Studies”—discuss metallic dental implants [2,3]. These two articles investigate dental implant surface integrity at different scales. The former investigates, at macro-scale, the implant geometry’s key role in osseointegration by comparing different implant profiles, to evaluate their influence on primary stability. The latter analyses, at micro-scale, the biological response of gingival cells to electrochemically anodized titanium surfaces in in vitro studies using a score-based reliability assessment.

The last article, entitled “Obtaining Biocompatible Porous Composite Material Based on Zinc-modified Hydroxyapatite and Lactide-Glycolide Copolymer”, studies the surface integrity of new composite material based on a zinc-modified hydroxyapatite framework coated with a copolymer of lactide and glycolide, with properties suitable for use in bone implants [4].

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