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Laser-assisted bioprocessing: more “light” on biomaterials

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Abstract: The development of laser processing techniques has been parallel to the growth and expansion of the biomaterials field. Lasers have the ability to accurately deliver large amounts of energy into confined regions of a material in order to achieve a desired response. These advantages are fully exploited in biomaterials where the laser is used to generate new materials (mainly at micro- or nanoscale) or to modify their surface properties to tune the interface of the biomaterials with the cells. Lasers can be used to produce large surface area biomaterials, such as nanofibres or nanoparticles without using any chemical additives. Amorphous bioactive glass nanofibers, with tailored chemical composition, and several centimeters in length can be obtained using laser spinning technique [1]. On the other hand, β -tricalcium phosphate or hydroxylapatite nanoparticles can be obtained by laser ablation in aqueous media [2]. Micro- or macroscopic bioactive glass scaffolds can be produced by laser-based rapid prototyping techniques. Chemical composition can be tailored along them [3]. Other approaches to process biomaterials with lasers consist in the modification of their surface properties. This can be done using two antagonist approaches, by coating the biomaterial with others using pulsed laser deposition (PLD) or laser cladding [4], or by precisely removing it using the laser texturing technique to produce a hierarchical nano/microstructure, or an alteration in their surface chemistry [5].

Keywords: laser, bioglass, nanofibres, nanoparticles, texturing

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Bio: Prof. Pou has been at University of Vigo since 1982, first as a student and now as a Professor and Director of the School of Industrial Engineering.