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Inorganic coating of luminescent porous silicon for nanomedicine applications

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Porous silicon (pSi) is a photo-luminescent material produced by electrochemical etching of crystalline silicon wafer. It is suitable for nanomedicine applications, because it is inert, biodegradable, bio-compatible and have no immune response. Furthermore, their optical properties, due to quantum confinement effect, are very interesting in perspective of bio-imaging applications. One of the main issues for the exploitation of the pSi micro-particles in nano-medicine is the fast quenching of the optical properties in aqueous environment. We previously demonstrated long-term optical stability by covalent attachment of polymers such as chitosan and PEG. In this work, we studied the optical properties stabilization of the micro-particles in a biological buffer (e.g., PBS) by depositing an inorganic TiO₂ layer by ALD (atomic layer deposition) in a rotary reactor. This process allows the deposition of a uniform layer with a fine tuned thickness. By optimizing the ALD parameters, we stabilized the optical properties of pSi micro-particles for more than three months (up to now). We investigated the effect of pSi-TiO₂ micro-particles on human dendritic cells (DCs) by *in-vitro* tests, finding no reduction of the DCs viability, but, in view of nanomedicine applications, their ability to increase the immune cell activation by other agonists has to be considered. These results and their proved photoluminescence stability in aqueous solutions gave the chance to pSi-TiO₂ micro-particles to be a promising candidate for nanomedicine applications.

Biography

Nicola Daldosso is a Researcher in Experimental Physics at University of Verona in Italy since 2011, where he leads the Fluorescence Laboratory. He is a Member of the School of Applications of Nanomaterial and Nanotechnology for Medicine, University of Verona. His research interests include structural and optical properties of nanostructured materials (in particular nano-silicon) as well as erbium doped systems and integrated optoelectronics (photonics) on silicon. He is author of 108 publications and communications, co-author of 6 chapter books and holds 1 patent.

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