PhD in Material Science and Tecnologies

Research Title: Laser based materials processing with ultra-short pulses for functional applications

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Context of the research activity	Laser processing of materials is a fast growing topic in industrial processes driven by the industry requirements. A field emerging in its beginning stage is the laser processing of materials by ultra-short pulses (having durations ranging from nano-seconds to picoseconds and femtoseconds). This technique allows for ultra-precise machining of all types of materials: i.e. polymers, metals and ceramics. Moreover, adjusting the power and the pulse characteristics, it is possible to go beyond the mere possibility of milling and drilling. Indeed, by laser processing of surface one can create micro- and nano-texture that turns out in e.g material coloration, the so-called “structural coloring”. These characteristics make the subject a wide field of experimentation with industrial application as a focus in the field of structural coloring, marking, customization and branding.

Objectives	The candidate will work on the use of ultra—short laser pulses for micro- and nano-texturing of ceramics, glasses, metals and polymers for applications such as structural coloring and functional surfaces. The research will comprise three main topics that the candidate should master:

	- Use of commercial ultra-short laser systems and customization for arbitrary shape machining and arbitrary surface treatment. - Study of the interaction between laser pulses and the different materials in terms of its properties (mechanical, optical, functional, etc.), including a structural investigation of the effects of different laser parameters on the studied materials. - Develop applications in the field of structural coloring, marking and surface texturing.

Skills and competencies for the development of the activity	The candidate should be very motivated, able to work autonomously and in a team. We look for a candidate interested in all the aspects of the research, from the more fundamental ones like laser-matter interaction to the more applied like the potential industrial and scientific applications. Knowledge of a programming language like Python, Matlab, C++ and Labview is an added value. Having previous experience on the subjects is a plus but is not mandatory.