Towards laser based methods for improving surface properties of materials

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Traditional chemical modification techniques used to alter the surface properties of diverse biomaterials possess drawbacks, such as leaving additional chemical toxicity from the solvents used and altering the mechanical stability. As an alternative approach for surface treatment, ultra-short pulsed laser processing (Fig. 1) is a non-contact method that enables a unique route to manipulate diverse biomaterial surfaces without severe thermal damage leading to heat-affected zones. Application of ultra-short laser radiation induces precise surface modification of scaffolds and allows the creation of multifunctional geometries with the potential to affect the biomimetic and antimicrobial properties of the constructs.

By finely tuning the laser processing parameters (scanning velocity (V), laser fluence (F), and a number of applied laser pulses (N), it is possible to influence the surface roughness, thus altering the wettability of the materials without disrupting their chemical composition. The conducted research was performed on a number of materials and has demonstrated that surface topography has a great influence on the biomimetic and antimicrobial behavior [1,2] of materials used in biomedicine and in everyday life.

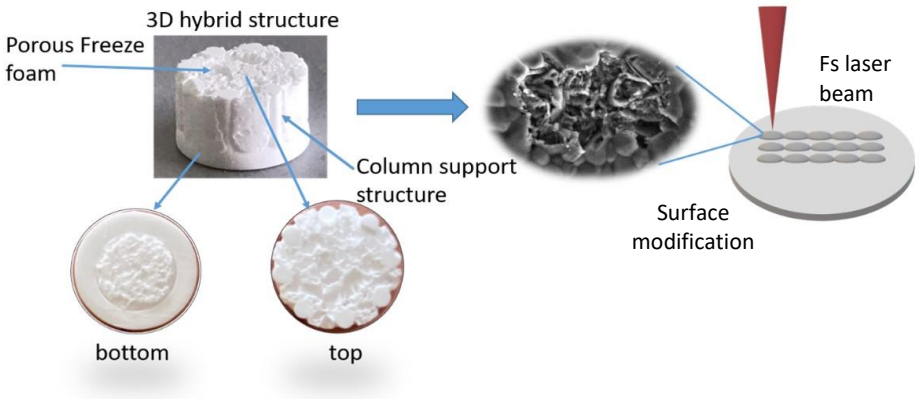

Fig. 1. Ultra-short laser surface modification of ceramics.

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