Direct laser interference patterning for photocatalytically active self-cleaning surfaces

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ABSTRACT

Laser surface structuring has long proven to be a suitable tool to produce surfaces that repel both water and bacteria on actively antibacterial and inert surfaces. As a mostly undesired side effect, the laser induced surface oxidation, that occurs when producing the pattern can also have a significant effect on the behavior of the surface. For this reason, the focus of this work is to employ direct laser interference patterning to not only affect the surface topography of titanium but to simultaneously produce a precisely tailored oxide layer. Using this approach, photocatalytically active surfaces were produced. Those surfaces can produce a variety of radicals when illuminated with UV-A light which are then used to degrade organic compounds like bacteria or organic waste. With this in mind, this work aims to develop a one-step production method for self-cleaning surfaces that uses not only the lasers topographical but also its chemical surface modifications to produce photocatalytically active surfaces with high surface area.