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# Micronanostructuring of titanium surface by ICP plasma etching for implantable medical devices

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## Résumé

Titanium is the material of choice used in implantable medical devices (DMI) thanks to its biocompatibility and its mechanical properties. One of the potential problems encountered with these devices, when they are implanted in the human body, is the cell colonization on the titanium surface, and the presence of residual bacteria. To deal with this problem, it can be interesting to structure the surface of the titanium at the micronanometer scale. In fact, structured surfaces can induce an antibacterial action that can be classified into two categories according to their specific functionalities: surfaces preventing bacterial proliferation and surfaces having bactericidal power(1). Bacteria adhesion depends on the surface characteristics such as its chemical composition, its roughness, its surface topography or its wettability (2). By controlling structures dimensions, we can control the roughness and the wettability of the surface. In this research, we worked on the micronanostructuring of titanium by ICP plasma without mask. We etched titanium wafers with chlorinated plasma in the regime of overpassivation. This process allowed us to obtain black-titanium. When we modify the process parameters (ICP power, working pressure, RF power, gas flow), we can modulate the dimensions of structures obtained on the etched titanium surface, and therefore, their roughness and wettability.

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(2) O. Seddiki, C. Harnagea, L. Levesque, D. Mantovani, et F. Rosei, " Evidence of antibacterial activity on titanium surfaces through nanotextures ", *Appl. Surf. Sci.*, vol. 308, p. 275-284, juill. 2014, doi: 10.1016/j.apsusc.2014.04.155.

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**Mots-Clés:** Titanium, ICP plasma, micronanostructure, etching

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