

Supplementary Information S2

Interactions of polyvinyl acetate dispersions with nanostructured superhydrophilic and superhydrophobic Ti6Al4V alloy surfaces

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S2: XPS analysis of molecular surface composition

XPS analysis was performed to analyze the composition of the Ti6Al4V and the nanostructured TiO₂ surface as well as of the latter after subsequent polydimethylsiloxane (PDMS)-modification on a molecular level. For this, XPS survey spectra are shown for all surface states (Fig.S2.1).

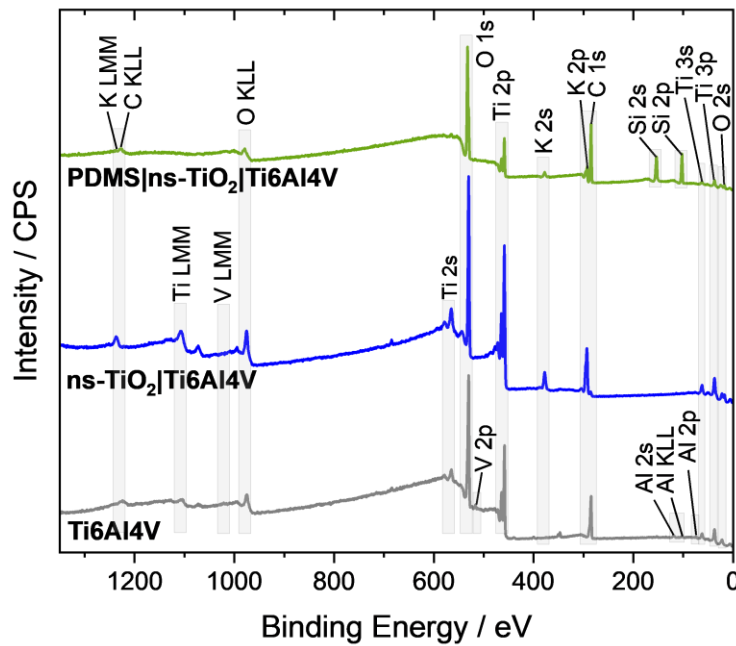


Fig.S2.1 XPS survey spectra of the Ti6Al4V, ns-TiO₂/Ti6Al4V and PDMS/ns-TiO₂/Ti6Al4V surfaces

On the Ti6Al4V surface characteristic signals for the alloy, which are for carbon, titanium and minor amounts of aluminium and vanadium can be detected. The high amount of oxygen on the surface proves the presence of an oxide layer. On the nanostructured TiO₂ surface, mainly signals for titanium and oxygen could be detected, while the amount of carbon is significantly reduced. This evidences that the applied etching and calcination process results in a TiO₂ surface. However, potassium can be detected, which is possibly due to the formation of potassium titanates during the process. This has also been observed in other studies [1, 2] and is further discussed in section 2.2 of the main manuscript. After PDMS-modification, the signals representing the polymer could be detected, which is mainly carbon, silicon and oxygen (for PDMS structure see Fig. 1, main manuscript). At the same time the signal in the Ti2p peak region decreases significantly, which shows that the surface is most likely covered from the PDMS film. The latter exhibits a layer thickness in the low nanometer range according to literature [3]. Together with the signal for Ti2p, the signal corresponding to K2p is reduced, as expected.

To provide unambiguous evidence of PDMS on the PDMS|ns-TiO₂|Ti6Al4V surface, an XPS high resolution spectrum as obtained in the Si2p peak region is shown (Fig.S2.2).

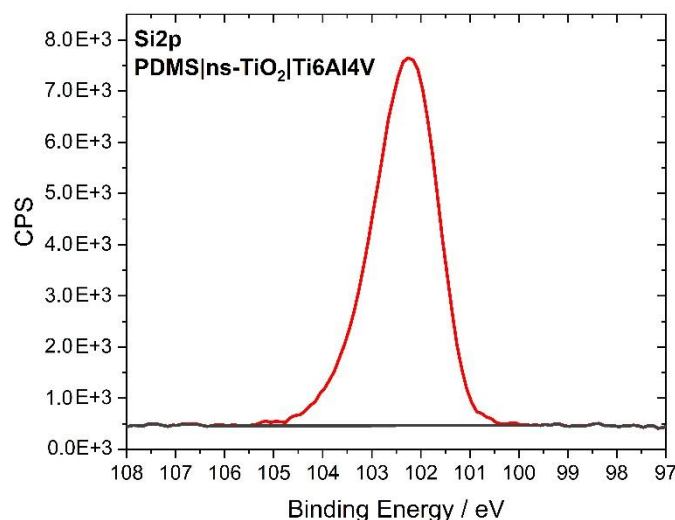


Fig.S2.2 XPS HR spectrum of the PDMS|ns-TiO₂|Ti6Al4V surface as obtained in the Si2p peak region

While the shown Si2p signal is present on the PDMS-modified surface with high intensity, no signals could be detected on the Ti6Al4V and ns-TiO₂|Ti6Al4V surface in the same binding energy region. In combination with the HR spectra obtained in the C1s and O1s peak region (Fig. 3, main manuscript) and the previously discussed signals based on the survey spectra (Fig.S2.1), this clearly confirms the successful PDMS surface modification.

Literature

- [1] Anitha VC, Banerjee AN, Joo SW, Min BK (2015) Morphology-dependent low macroscopic field emission properties of titania/titanate nanorods synthesized by alkali-controlled hydrothermal treatment of a metallic Ti surface. *Nanotechnology* 26(35):355705. [https://doi.org/ 10.1088/0957-4484/26/35/355705](https://doi.org/10.1088/0957-4484/26/35/355705).
- [2] Divya Rani VV, Manzoor K, Menon D, Selvamurugan N, Nair SV (2009) The design of novel nanostructures on titanium by solution chemistry for an improved osteoblast response. *Nanotechnology* 20(19):195101. [https://doi.org/ 10.1088/0957-4484/20/19/195101](https://doi.org/10.1088/0957-4484/20/19/195101).
- [3] Tesler AB *et al.* (2021) A One-Pot Universal Approach to Fabricate Lubricant-Infused Slippery Surfaces on Solid Substrates. *Adv. Funct. Mater.* 31(27):2101090. [https://doi.org/ 10.1002/adfm.202101090](https://doi.org/10.1002/adfm.202101090).