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Simultaneously improving surface mechanical properties and *in vitro* biocompatibility of pure titanium via surface mechanical attrition treatment combined with low-temperature plasma nitriding

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Abstract: In this paper, low-temperature plasma nitriding at 550 °C for 4 h was performed on a pure titanium sample with nanostructured surface layer induced by surface mechanical attrition treatment (SMAT). Microstructure, surface topography, surface mechanical properties and *in vitro* biocompatibility of SMAT nitrided titanium sample were investigated in comparison with those of original and SMATed samples. Experimental results revealed that a nanostructured nitrides layer was fabricated on the surface of SMAT nitrided titanium sample, leading to enhance the surface hardness and to reduce wear volume. Additionally, the surface roughness and wettability of SMAT nitrided sample are different from those of the original and SMATed samples. Furthermore, the SMAT nitrided sample exhibits promoted cell attachment, proliferation and differentiation compared to those of the original and