

Nanostructured surfaces

Formation of the nanostructured surface layer of the dental Co-Cr-Mo alloy by sandblasting

M.A. Vasylyev¹, V.S. Filatova¹, I.N. Makeyeva¹, P.A. Gury²

¹ Department of the Atomic Structure and Surface Dynamics, G.V. Kurdyumov Institute for Metal Physics, Natl. Acad. of Sci. of Ukraine. Acad. Vernadsky Boulevard, 36, Kiev-03142, Ukraine.
E-mail: filatova@imp.kiev.ua

² Department of Dental Orthopedics, Institute of Dentistry, Shupyk Natl. Med. Acad. of Postgraduate Education, Str. Dorohozhytska 9, Kiev-04112, Ukraine.

It is well known that many service properties of the medicine alloys depend on the structure and properties of their surface. Sandblasting as a surface treatment method is primarily used for surface cleaning. Previously study has shown the possibility of formation a nanostructured surface layer in alloys with low SFE [1].

The aim of this work was to set up the possibility of nanostructured surface layer formation on the dental Co-Cr-Mo alloy by sandblasting and to determine its effect on corrosion properties of the surface.

Sandblasting was carried out at the instrument Heraeus Combilabor Kulzer CL-FSG94 which is widely used in dental practices. Samples were processed powder of pure corundum, particle size – 250 m and 125m. The processing time ranged from 1 to 60 s. Surface states after treatment studied by the methods of SEM, TEM, XPS and measured surface potentials.

It has been founded that the sandblasted surface layer is enriched oxide, without implanting particles Al₂O₃. It was set up parameters of Co-Cr-Mo alloy treatment, in which there nanostructured surface layer thickness of 5 m. Grain size increases monotonically from 30 nm to 90 nm in depth. Formation of nanostructures due to three important factors: 1) a high degree of deformation; 2) high-speed deformation (estimated at about $10^3 - 10^4$ s⁻¹); 3) multidirectional shock load that is repeated.

As a result of the formation more perfect nanostructured surface layer was significant improvement of Co-Cr-Mo alloy corrosive properties, which suggests increase its biocompatibility.

1. Petrov Yu. N., Vasylyev M. A., Trofimova L. N., Makeyeva I. N., Filatova V. S. Layer wise evolution of the Cu–Zn alloy microstructure after sandblasting// App Surf Sci.-2015.-**327**.-P. 1–6.