Effect of Gas Nitriding on Ti-20Nb-20Zr titanium alloy microstructure

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Today, great interest is focused on studying new titanium alloys of β type, such as Ti-20Nb-20Zr. This is explained by the fact that such alloys have higher mechanical characteristics than c.p. titanium. In addition, due to alloying with bioinert elements such as Nb and Zr, these alloys have higher biocompatibility than the widely used Ti6Al4V alloy, which is alloyed with toxic elements. The advantages include their low elastic modulus and higher corrosion resistance. However, like all titanium alloys, β-rich titanium alloys have low tribological characteristics, limiting their use for load-bearing implants. To solve this problem, to improve the wear resistance of a new β-rich Ti-20Nb-20Zr titanium alloy by gas nitriding was proposed. The work investigates the correlation between the phase-structural state and temperature-time parameters of gas nitriding of Ti-20Nb-20Zr titanium alloy. According to TEM and EDX analysis, an atypical hardened surface layer was formed after gas nitriding, consisting of not only titanium nitrides (TiN and Ti2N) but also nitrides based on Nb and Zr. Also, in the near-surface layer, martensitic and Zr-rich zones were observed, which smoothly transitioned into the α and β phases, respectively.