# Oxygen influence on the elasticity modulus of Ti-13Nb-13Zr alloy used as biomaterial

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Titanium-based alloys are widely used as load-bearing orthopedic implants, due to low elasticity modulus, good corrosion resistance and excellent biocompatibility. The Ti-6Al-4V is the most used Ti alloy as biomaterial, however, recent studies had shown that Al and V could cause toxic effects. This alloy has until a relatively high modulus (about 120 GPa) when compared with that of the bone (about 28 GPa). It is know that elasticity modulus of titanium alloys is a very important property for applications in implants. Long-term experience indicates that the high moduli of alfa+beta titanium implants transfer insufficient load to adjacent remodeling bone and this results in bone resorption and eventual loosening of the prosthetic devices. The Ti-13Nb-13Zr (TNZ) alloy developed by Davidson & Kovacs does not possess toxic elements and presents an elasticity modulus of around 65 GPa (in aged condition). The mechanical properties of the alloy are modified in significant way with the presence of interstitial elements such as oxygen, carbon, nitrogen and hydrogen, mainly its elastic properties, causing the hardening or softening of the alloy. The samples used in this study were polycrystals of the TNZ alloy supplied by FAENQUIL, produced by arc melting and were submitted to several oxygen charges. This work shows the study of the oxygen influence on the elasticity modulus of TNZ alloy by mechanical spectroscopy measurements, using a torsion pendulum operating at frequencies ranging from 4 to 21 Hz and temperature between 90 and 700 K. Once the TNZ alloy is used as biomaterial, it had been made corrosion and in-vitro biocompatibility measurements to verify the oxygen effect in the samples.

**Palavras-Chave:**

Ti alloys, Biomaterials, Anelasticity