Margarita A Khimich et al., J Biotechnol Biomater 2017, 7:2 (Suppl)
http://dx.doi.org/10.4172/2155-952X.C1.074

Influence of selective laser melting mode on the structure and phase composition of Ti-Nb alloy

Margarita A Khimich, Anna Yu Eroshenko, Zhanna G Kovalevskaya, Alexander A Saprykin and **Yurii P Sharkeev**
ISPMS SB of RAS, Russian Federation

Ti-Nb alloys are perspective for implants production. Titanium and its alloys have high elastic modulus (100-120 GPa). Due to their features alloys of Ti with (40-45) wt. % Nb have modulus close to that of bone. Selective laser melting (SLM) allows obtaining of low-modulus Ti-Nb alloys and items of complex shape. Change of SLM parameters affects the size of structural elements and phase composition of resulting product. The purpose of this study was to investigate influence of SLM parameter change on the structure and phase composition of Ti-(40-45) wt. % Nb alloy. 3-D specimens obtained in Yurga Institute of Technology (Russia) on "VARISKAF-100MVS" installation were investigated. To obtain the alloy the composite powder of titanium and niobium was obtained by mechanical activation of titanium and niobium powders mixture in AGO-2C ball mill (AltSTU, Barnaul, Russia) and was layered on titanium substrate. After activation composite powder was annealed in vacuum at 500°C during one hour. The thickness of each layer was 0.05 mm. Melting process was carried out in Ar atmosphere. Specimens were formed with the laser beam of 80 W-power. The spot diameter was 150 μm, scanning step was 0.4 mm. As a changed parameter laser beam scanning velocity was selected. It was changed in the range 40-70 mm/sec with the step of 10 mm/sec. The results of investigation have shown that the alloy obtained by SLM has an elemental composition of Ti-45 wt. % Nb. Powder is completely melted and crystallized during SLM. The structure is represented by two phases. They are the main β-solid solution of titanium and niobium and α"-Ti containing Nb. The microstructure contains zones with fine and medium grains. Shrinkage and gas pores are observed in specimens.

Biography

Margarita A Khimich graduated in Physics, and is a Technical Faculty of National Research Tomsk State University. She earned a Bachelor of Technical Physics in 2013. She presented her Master's thesis devoted to alloys of Ti-Nb system and severe plastic deformation of Ti-Nb alloy in 2015. Currently, she is a postgraduate student at National Research Tomsk State University and also a Researcher of the Laboratory of Physics of Nanostructured Biocomposites, Institute of Strength Physics and Materials Science. She takes part in the project of Russian Science Foundation devoted to selective laser melting of biocompatible Ti-Nb alloys.

khimich@ispms.tsc.ru