EBSD study of deformation induced twinning and transformation of Ti-(23-29)Nb-7Zr-(0.5-0.8)O alloy

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Ti-Nb-Zr-O alloy system is intended for applications in load-bearing biocompatible implant due to its low elastic modulus and high strength. The lowest modulus is achieved in alloys having low stability of the β phase, which is also favorable for formation of deformation induced martensite. Oxygen, the main solid solution strengthening element, also suppresses the martensite [1]. However, the transformation and twinning sequences in these alloys are still not fully elucidated.

Ex-situ X-ray diffraction (XRD) were performed on the alloys at different stages of deformation up to 5 %. Deformation induced martensite was observed in the samples containing 23 and 26 wt% of Nb, which were then subjected to in-situ EBSD tensile tests. The interplay of twinning and martensitic transformation and reversal during loading and unloading was described in these alloys.

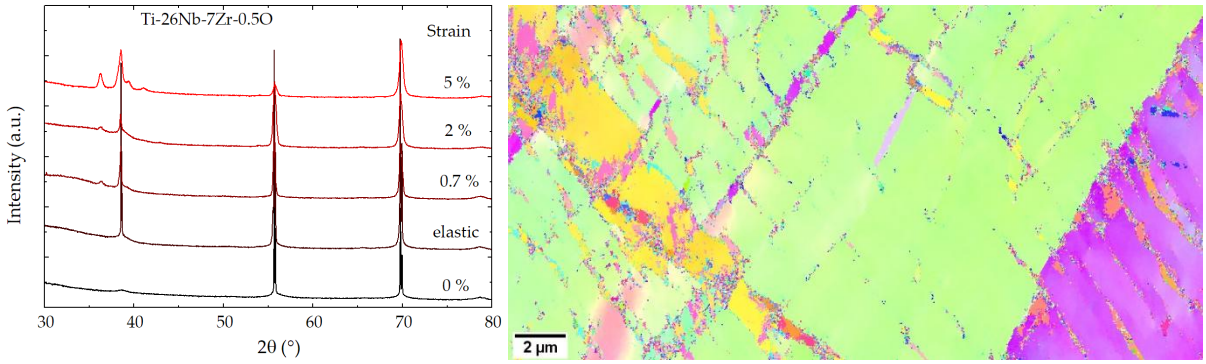

Fig 1: Ex-situ XRD and EBSD of the deformed Ti-Nb-Zr-O alloy.

Keywords: titanium, martensite, EBSD, biomedical, twinning

References:

[1] Stráský J, Preisler D, Seiner H, Bodnárová L, Janovská M, Košutová T, et al. Achieving high strength and low elastic modulus in interstitial biomedical Ti–Nb–Zr–O alloys through compositional optimization. Mater Sci Eng A 2022;839:142833. https://doi.org/10.1016/j.msea.2022.142833.