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Investigation of metastable precipitates in Ti-15Mo by in-situ SANS

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Titanium alloys have plenty of applications in industry and medicine due to unique combination of high strength, low density, and excellent biocompatibility [1]. Here, we would like to demonstrate results of investigations of Ti-15Mo (wt.%) alloys using small-angle neutron scattering (SANS). These alloys contain metastable ω (hexagonal) and α (hcp) precipitates in β-phase matrix. The resulted microstructure has grate impact on mechanical properties and thermostability of the material. SANS data were acquired at three directions of the single crystal sample –[111], [110] and [100] of β-phase. Heating rates of 1K/min and 5 K/min were applied for the in-situ measurements. Observed spots at 2D SANS patterns at temperatures lower than 560 0C were formed by isothermal ω precipitates arranged in simple cubic structure. Increasing of temperature leads to growing of volume fraction of these ω precipitates and increasing of mean interparticle distance. Ω phase became invisible at maximum instrumental resolution then temperature approach 580 0C and simultaneously slightly stronger scattering was detected from very long α particles. Structure of these α precipitates was not changed during cooling down from 600 0C to room temperature.
[1] Lutjering G, Williams JC (2007) Titanium. Engineering materials, processes. Springer, Berlin, pp 1–39. doi:10.1007/978-3-540-73036-1.

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