Phase transition kinetics and titanium compressibility

A.V. Sedov, A.E. Shestakov

Russian Federal Nuclear Center - Zababakhin All-Russia Research Institute of Technical Physics

(RFNC-VNIITF), Snezhinsk, Russia

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*e-mail: *a-sedov86@mail.ru*

X-ray diffraction measurements are taken on the sample of commercially pure titanium under static loading and room temperature. A single crystal X-ray diffractometer with the Imaging Plate two-axis detector was used for measurements in the Mo-Kα radiation. Static loading was created using the membrane-type high-pressure cell with anvils having 500μm in diameter. Sodium chloride (NaCl) served as the pressure propagation medium and the diffraction standard. The gasket was made of inconel metal.

Pressure attained in experiments was 8.3±0.3 GPa (83 kbar). Data on changes in structural characteritics of the titanium α-phase under pressure were obtained, i.e. parameters of the crystalline lattice and the elementary cell volume.

Initial stage kinetics for the α→ω transition was recorded in the course of 66-hour exposure to 8 GPa constant pressure (Fig.1).

After this exposure, the sample was found to be in the two-phase state. Under cell release, the reverse ω→α transition was not observed to take place. The Rietveld method helped to update experimental data in the FullProf code. Parameters of the α-, and ω – phases were determined at 8 GPa and in the final two-phase state at standard pressure.

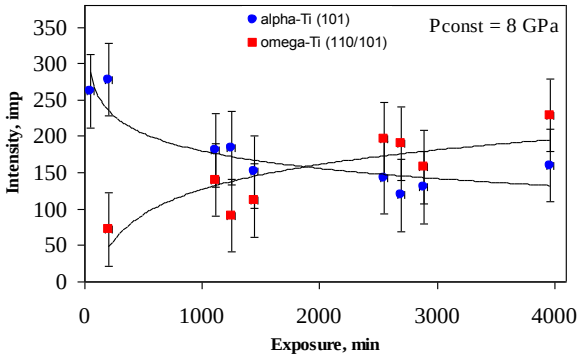

Figure1.Intensity of largest peaks of α -, and ω - phases in titanium. Exposure to 8 GPa constant pressure.

Volume per one atom at standard pressure was 17.7 (α) and 17.4 (ω) Å^3/at with the 1.7 % defference there between. After release, weight content of phases at standard pressure was determined to be α - 71% and ω - 29%.