

α phase lamellae orientation relationship in metastable β titanium alloys**Petr Harcuba¹, Jana Šmilauerová¹, Václav Holý²**¹*Department of Physics of Materials, Charles University, Praha 2, Czech Republic;*²*Department of Condensed Matter Physics, Charles University, Praha 2, Czech Republic;**Harcuba.p@gmail.com*

Metastable β titanium alloys are widely used as construction materials in automotive and aerospace industry. These applications demand materials with superior properties, such as high specific strength, good ductility and excellent fatigue and corrosion resistance. The improvement of strength can be achieved through ageing treatment which results in the formation of small precipitates of thermodynamically stable α phase in the metastable β matrix. When the α precipitates are very fine and homogeneously distributed, the strength of the alloy increases without a significant deterioration of the ductility. This fine microstructure can be achieved by employing such heat treatment in which the α phase precipitation is preceded by ω phase formation. ω phase is a metastable phase occurring as nanometric-sized, homogeneously dispersed particles. ω -assisted α phase nucleation results in very fine α phase microstructure.

In this study, very small precipitates of the α phase were studied by scanning electron microscopy (SEM). This observation allowed us to investigate the orientation and spatial relationship between Alpha phase lamellae and Beta phase matrix. The SEM study was supplemented by the measurement of small-angle x-ray scattering (SAXS) which provides precise information on crystallographic orientation between the β and α lattices and on the shape and size of α precipitates. In order to assess the relationship of microstructure and mechanical properties of the material, Vickers microhardness was measured.

Keywords: Metastable Beta-Ti alloys, Alpha Phase, Alpha Lamellae

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