

# High-energy Ball Milling and Subsequent Heat Treatment of Ti-Cu-Si-B Powders

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## **Abstract:**

Multicomponent alloys with metal matrix and based on the Ti<sub>6</sub>Si<sub>2</sub>B phases are potentially attractive for structural applications. However, there is limited information in literature on effect of alloying in stability of the Ti<sub>6</sub>Si<sub>2</sub>B compound, which presents its single-phase region close to the Ti-22Si-11B alloy composition (at%). In this sense, this work discusses on effect of copper addition on the stability of the Ti<sub>6</sub>Si<sub>2</sub>B compound. Elemental powder mixtures were used to prepare the Ti-xCu-22Si-11B (x = 2 and 6 at.-%) alloys by high-energy ball milling and subsequent heat treatment (1100°C for 240 minutes). The as-milled Ti-Cu-Si-B powders and heat-treated samples were characterized by X-ray diffraction, scanning electron microscopy, and energy dispersive spectrometry. Similar behavior was noted during ball milling of Ti-Cu-Si-B powders, i.e., the Ti<sub>5</sub>Si<sub>3</sub> phase was formed after milling for 180 minutes. The mechanically alloyed and heat treated Ti-2Cu-22Si-11B alloy presented a matrix of Ti<sub>6</sub>Si<sub>2</sub>B dissolving close to 2 at% Cu. Precipitates of Ti<sub>5</sub>Si<sub>3</sub> and other unknown Cu- and Fe-rich phase were also identified in microstructures of these quaternary alloys, whose amounts were increased in the mechanically alloyed and heat treated Ti-6Cu-22Si-11B alloy.