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Microstructure and mechanical properties of Ti₆Al₄V /tin prepared by spark plasma sintering technique

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Failure in aerospace structural components has catastrophic consequences, which results in loss of lives and of the aircraft. Titanium alloys play an important role in the aerospace industry; however, this alloy's application is limited by the poor mechanical properties it exhibits. Researchers have reported that microstructure and mechanical properties of Titanium alloys can be improved by ceramic reinforcements, hence the purpose of this study is to study the microstructural evolution and mechanical properties of Ti₆Al₄V reinforced with varying TiN particulates prepared by SPS technique. Spark plasma sintered composites were produced from the admixed powders and the effect of TiN on the microstructure and mechanical properties of the composites were studied and analyzed. Scanning electron microscope (SEM-EDS) was used to study the bulk morphology of the resultant spark plasma sintered composites. The phases formed in the developed sintered composites were detected by energy dispersive X-ray diffraction spectrometer (XRD) Micro-hardness was explored by the means of a high impact diamond Dura scan micros hardness tester and a densimeter was used to measure the density. The electrochemical behavior of the composites were measurements by the help of PGSTAT101 using potentiodynamic polarization method Analysis of density and hardness values revealed that the effect of TiN was more evident in improving the microstructure and mechanical properties of Ti₆Al₄V alloy. Within the parameters used, the highest values of the characterized properties were achieved at 5wt% TiN with improved hardness and corrosion properties.

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