Microstructural, Tribology, and Densification Studies of Spark Plasma Sintered Titanium Matrix Composites Reinforced with Silicon Carbide

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Abstract
Spark plasma sintered titanium matrix composites (TMCs) with varying SiC contents were fabricated at 900 o C, 150 o C/min, 30 MPa, and with 5 min of holding time, and were studied for structural, mechanical and tribology performances. The phase identification and microstructure analysis of the sintered specimens were examined using X-ray diffraction and scanning electron microscope equipped with EDS. The results indicate that influence of the varied SiC content dictate the physical properties of the sintered TMCs. The densification study showed that relative density was inversely related, while Vickers hardness value was directly proportional (238.84 Hv at 1 wt. % SiC and 361.81 Hv 6 wt. % SiC). The tribology study showed that both wear rate and coefficient of friction have inverse relationship while wear resistance has a direct trend with the composite reinforcement. Sample TiNiAl – 6 wt. % SiC, with the optimum composition had the best wear performance under the constant load of 20 N. This wear performance can be attributed to the good interfacial bond formed between the TiNiAl matrix and the SiC reinforcement in the developed composites contributed from the synergetic processing conditions of the SPS process.

Full-text
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