The Optimization of Sintering Conditions for the Preparation of Ti-Al-Si Alloys

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This work deals with optimization of Spark Plasma Sintering conditions for the preparation of Ti-Al-Si alloys. Ti-Al-Si alloys are appropriate material for high-temperature applications, especially for aerospace and automotive industry. They are characterized by low density, good mechanical properties and resistance against oxidation. Ti-Al-Si alloys were prepared by powder metallurgy using reactive sintering, followed by milling and Spark Plasma Sintering. Preparation of intermetallic compounds is complicated due to high melting points of intermediate phases, the exothermic reaction during their formation and high reactivity of the melt with melting crucible. TiAl10Si20 alloy was prepared by Spark Plasma Sintering under a pressure of 48 MPa and by High Pressure Spark Plasma Sintering under pressure of 6 GPa. The temperature was chosen between 1100 °C and 1204 °C. The porosity of TiAl10Si20 alloy decreases with pressure and with the high pressure also increases the hardness by 200 HV 5. Abrasive wear resistance of TiAl10Si20 alloy is very good.

Keywords: Intermetallics, Powder Metallurgy, Spark Plasma Sintering, High Pressure Spark Plasma Sintering

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