

Studies on Ti-Sn Alloys & Ti-Sn-TiB Metal Matrix Composites by Semi-Solid Metal Powder Forming

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ABSTRACT

Semi-Solid Metal Powder Forming (SSMPF) involves mixing elemental Ti and Sn powders followed by compacting the mixture under predetermined pressures and temperatures. At compacting temperatures, the Sn is melted and forced to fill up the gaps formed by the Ti particles to form a near 100% dense green part. During alloying process at an appropriate temperature, the Sn diffuses into Ti to form a near 100% α -Ti structure. SSMPF is also conducted to produce Ti-Sn-TiB metal matrix composites by in-situ forming of TiB reinforcement via addition of elemental B powder and ex-situ forming via addition of TiB particles. The microstructures and phase transformation of the Ti-Sn alloys and Ti-Sn-TiB composites materials are examined. The tensile tests are conducted and the properties were evaluated. We find that SSMPF process produces complex components with near void free microstructures, near zero shrinkage and high tensile strength. The characteristics of the SSMPF process make it a true net shape forming technology.