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Microstructure evolution of Nb/Nb5Si3 alloys fabricated by laser additive manufacturing

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In this research, 2~3μm Si powder and 50~80μm Nb powder were respectively proportioned according to the atomic ratio of Nb5Si3 and Nb3Si compounds, in which the Nb was used as the main particle, so that after ball milling the surface of the Nb particle was surrounded by the Si particles. Further, this kind of mixture powder was subjected to plasma processing for the composite particle spheroidization. Then, the as-obtained spheroidized composite Nb-Si composite powder was used as the raw material for mixing with with pure Nb powder and pure Ti powder to form Nb-17Si-23Ti alloy by laser melting deposition (LMD). The microstructure evolution of LMDed NbSi alloys under different laser powers (800W, 1000W, 1200W) was studied. The Nb-17Si-23Ti alloy exhibited a uniform microstructure, and the Si content in NbSi compounds decreases from 25.6% to 23.7% with the increase of laser power from 800W to 1000W. Furthermore, with the low power of 800W, 1000W, the formed Nb-Si compounds distributed scatteringly on the continuous Nbss matrix.