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Liquid Phase Sintering of Boron-Alloyed Powder Metallurgy Stainless Steel

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Abstract : Liquid phase sintering (LPS) is a feasible means for decreasing the porosity of powder metallurgy (PM) Fe-based material without substantially increase the production cost. The aim of this study was to investigate the effect of 0.6 wt% boron on the densification of PM 304L stainless steel by LPS. The results indicated that the increase in the sintered density of 304L+0.6B steel is obvious after 1250 ºC sintering, and eutectic structures with borides are observed at the interfaces of the raw steel powders. Differential scanning calorimetry (DSC) results show that liquid is generated at 1244ºC during sintering. The boride in the eutectic structure is rich in boron and chromium atoms and is deficient in nickel atoms, as identified by electron probe micro-analyzer (EPMA). Furthermore, the sintered densities of 304L and 304L+0.6B steels sintered at 1300 ºC are 6.99 g/cm3 and 7.69 g/cm3, respectively, indicating that boron is a suitable alloying element for facilitating LPS of PM 304L stainless steel.

Keywords : powder metallurgy, liquid phase sintering, stainless steel, boron, microstructure
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