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Microstructure and Sintering of Boron-Alloyed Martensitic Stainless Steel

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Abstract : Liquid phase sintering (LPS) is a versatile technique for achieving effective densification of powder metallurgy (PM) steels and other materials. The aim of this study was to examine the influences of 0.6 wt% boron on the microstructure and LPS behavior of boron-alloyed 410 martensitic stainless steel. The results showed that adding 0.6 wt% boron can obviously promote the LPS due to a eutectic reaction and increase the sintered density of 410 stainless steel. The density was much increased by 1.06 g/cm³ after 1225ºC sintering. Increasing the sintering temperature from 1225ºC to 1275ºC did not obviously improve the sintered density. After sintering at 1225ºC~1275ºC, the matrix was fully martensitic, and intragranular borides were extensively found due to the solidification of eutectic liquid. The microstructure after LPS consisted of the martensitic matrix and (Fe, Cr)2B boride, as identified by electron backscatter diffraction (EBSD) and electron probe micro-analysis (EPMA).

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