Development of PM Stainless Steels with Improved Properties through Liquid Phase Sintering

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Abstract

The use of boron for successfully obtaining high density PM stainless steels with improved mechanical properties and corrosion resistance is presented. Boron is added as part of master alloys which have been specifically designed to provide the formation of wetting liquid phases with excellent characteristics for producing controlled densification and alloying of 316L and 304L austenitic stainless steels. The as-sintered density and properties of these alloys is determined by the amount of master alloy, the chemical composition of the stainless steel powder, the sintering temperature and time. The microstructural development and alloy homogenisation are determined by the chemical composition of the Fe-based powder and the chemical reactions taking place between the basic powder and the master alloy particles during high temperature sintering. The use of this master alloy is shown to lead to stainless steels with outstanding combinations of strength and ductility. The influence of alloying and the sintering conditions on the final microstructure, density, corrosion resistance and tensile properties is also discussed.