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Sintering of a hypoeutectic high chromium cast iron as well as its microstructure and properties

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Abstract: A hypoeutectic high chromium cast iron (HCCI) was fabricated by super-solidus liquid phase sintering (SLPS) technology with gas atomized powders as raw materials. The effects of sintering parameters on densification, microstructure evolution and mechanical properties of the alloy were investigated systemically. The results showed that samples with full density could be fabricated and sintering temperature window suitable for SLPS is around 20°C. The X-ray diffraction (XRD) revealed that the hypoeutectic HCCI mainly consists of martensite matrix and M_7C_3 carbide as well as small amount of austenite, and optical metallographic analysis showed that M_7C_3 carbides are of crystal square bars with uniform distribution in the matrix. As sintering temperature or holding time is raised, both grain and carbide are gradually coarsen, while the strength and toughness of the alloy increase at first and then decline. The mechanical properties of sintered hypoeutectic HCCI in an optimized sintering process were of hardness HRC63, bending strength 2241MPa, and impact toughness 8.0J/cm². A model about microstructure evolution in sintered hypoeutectic HCCIs has been proposed.

Key words: hypoeutectic HCCIs; SLPS; microstructure; mechanical properties; model

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