Precise Complex Briquetted Modifiers with an Inoculating Effect for High-strength Cast Iron Making

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Abstract

Conditions of preparation of briquetted modifiers containing ultradisperse inoculating additives, including nitriding ones, were investigated. The compactibility and formability of briquetted modifiers of different composition in the pressure range 200-600 MPa were studied. It was established that by changing the content of individual components in briquettes, one can control both the density and the porosity of briquettes at the same pressing conditions. At the same porosity, modifiers with a high content of a plastic component have a 2.5-3 times higher compression strength than that of modifiers with a high content of a brittle component. In comparative tests of briquetted and molten modifiers, it was established that the briquetted modifiers provide the formation of more disperse spheroidal graphite inclusions and a larger quantity of ferrite in cast iron. It was shown that the degree of spheroidizing above 90% is achieved at a 1.25-1.50 times smaller consumption of briquetted modifiers than that of cast modifiers. The absence of binders in briquetted modifiers improves the quality of iron castings. The use of briquetted modifiers with a nitriding effect provides an increase in the strength of cast iron by a factor of 2.5-3.0.

Investigation of Mechanical Properties of Powder Metallurgy Parts with Control of Microstructure

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Abstract

In the present work, two kinds of steel powder were (Distaloy HP-1 & Ultrapac-LA) selected and subjected to powder metallurgy processing. For Ultrapac-LA a heterogeneous microstructure consisting of tempered martensite, nickel-rich ferrite, divorced pearlite and nickel-rich regions surrounding pores is observed. For Distaloy HP-1, in slow cooling rates (0.4 °C.s-1) the amounts of martensite and bainite varies between 50-60% and 30-40% , however, for fast cooling rates (1.2 °C.s-1) the variation is between 70-80% and 10-20% . The mechanical properties of the prepared samples were studied with controlled production conditions such as cooling rate and heat treatment. increasing porosity plays an important role in the tensile stress and fatigue strength. The ultimate tensile strength and fatigue strength were more than 1000 MPa and 400 MPa in this research (for Distaloy HP-1, 7.2 g.cm-3, 0.5% carbon content and fast cooling rates). Macroscopic examination of the fracture surfaces for all specimens revealed that fatigue crack growth and final fracture regions were brittle and without noticeable permanent deformation. The final fracture regions for all tests were very similar, final fracture in these two material conditions revealed brittle macrobehaviour and ductile microbehaviour.