KATEDRA ODLEWNICTWA
Wydział Mechaniczny Technologiczny
Politechnika Śląska

Rozprawa doktorska

Wpływ składu chemicznego i warunków obróbki cieplnej na mikrostrukturę oraz wybrane własności użytkowe staliwa wysokostopowego typu duplex GX2CrNiMoCuN 25-6-3-3

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Abstract

„The influence of the chemical composition and conditions of the heat treatment on selected usable properties of high-alloy duplex cast steel

GX2CrNiMoCuN 25-6-3-3 grade”

The doctoral dissertation presents the issues of shaping the microstructure and usable properties, including mechanical, as well as corrosion and abrasive wear resistance of duplex high-alloy cast steel, on the example of the GX2CrNiMoCuN 25-6-3-3 grade. Realization of the doctoral thesis in the above-mentioned problem of the analyzed ferritic-austenitic cast steel produced both in the laboratory and industrial conditions, required detailed research including the following research techniques: emission spectrometry, light-optical and scanning electron microscopy with EDS analysis, X-ray diffraction, thermal and derivative analysis, static and dynamic methods determination of mechanical properties, computer simulation of the crystallization and solidification process of castings, statistical analysis of measurement results, determination of corrosion resistance using the potentiodynamic method and resistance to abrasive wear using the gravimetric method.

The analysis of the obtained research results allowed to determine the optimal chemical composition and heat treatment conditions, i.e. primarily the value of the optimal annealing temperature for the supersaturation process, ensuring obtaining a valuable, especially in the current situation on the market of metal raw materials, a compromise between production costs and usable properties of castings, also the corrosion resistance, which is important for the studied cast steel.

The main achievement of the doctoral dissertation was to prove that the reduction as permitted by the applicable PN-EN 10283 standard in the concentration of often deficient alloying elements, i.e. Ni, Mo, Cu and Cr in the chemical composition of GX2CrNiMoCuN 25-6-3-3 cast steel, while reducing the value of annealing temperature for the supersaturation process in relation to the recommendations of the above-mentioned standards, allows obtaining a fully technologically useful casting.

In addition, as a result of the doctoral dissertation, original research results were obtained, which have great implementation potential for the domestic foundry industry, which was shown in a separate chapter of the doctoral dissertation on the example of the foundry Zakład Odlewnictwa i Śrutowania Zakłady Mechanicznych Wiromet S.A.