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TYPES OF MODIFIERS IN CAST IRON PRODUCTION

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Annotation

In this article, we studied the types of modifiers in the production of cast iron and technologies for obtaining cast iron.

Keywords: cast iron, iron, industry, technology, metallurgy.

Cast iron is a brittle material used for casting various objects (boilers, plumbing devices, architectural decorations, fences, etc.); an alloy of carbon with iron. Normal (unalloyed) cast iron contains more than 2.0% carbon and small amounts of permanent impurities - silicon, manganese, phosphorus and sulfur. Cast iron containing alloying elements - chromium, nickel, molybdenum, copper, aluminum and others, as well as more than 2% manganese and more than 4% silicon is called alloyed (special) cast iron. Cast iron is divided into gray, white and intermediate types. In gray cast iron, carbon is in a free state - in the form of globular, plate-like or spherical graphite, in white cast iron, most or most of the carbon is in the form of iron carbide $\Gamma'e3S$ - in the form of cement, and in intermediate cast iron, part of the carbon is in the form of cementite and part of graphite. According to the form of graphite in gray cast iron, it is divided into normal gray cast iron, malleable cast iron and very fine cast iron. In ordinary gray cast iron, graphite is in the form of a plate (leaf), in malleable cast iron it is cucumber-shaped (papapaga), and in very fine cast iron it is spherical.

Gray cast iron used for making ingots is also called pig iron. White pig iron is called malleable pig iron because it is mainly used for steel production. Malleable cast iron is produced by thermal processing and softening of white cast iron. It is marked with ordinary gray cast iron letters (KCH) and two two-digit numbers. For example, in KCH 1228, the letters KCH (SCH) ("gray cast iron", the first letters of the Russian words "serial cast iron") are gray Ch. number 12 indicates its tensile strength, and number 28 its bending strength limit (kg/mm²). Malleable cast iron is designated by the letters BCH (KCH) and two consecutive numbers, mac, the letters BCH (KCH) in BCH504 ("malleable cast iron", the first letters of the Russian words "kovkiy chugun") indicate the malleability of cast iron, the number 50 is the tensile strength



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the limit, and the number 4 indicates the relative elongation (in %). cast iron is produced from iron ores and polymetallic ores in metallurgical furnaces (blast furnaces, electric furnaces). In addition to gray and white cast iron, irons called ferroalloys are also produced in furnaces; such irons contain much more silicon and manganese than in ordinary irons. The following types of cast iron are of great importance in mechanical engineering.

Aluminum cast iron is a cast iron containing a large amount of aluminum, it is fire-resistant and corrosion-resistant, it is used as a non-magnetic material in electrical engineering. Antifriction cast iron - corrosion-resistant cast iron, used for making bearings and other frictional parts. Durable cast iron — strength does not decrease significantly when the temperature rises; cast iron working at high temperature is used for making fittings and other products. Refractory cast iron — has good resistance to oxidation at high temperatures; this property is created by adding more chromium to it, it is used to prepare details working at temperatures up to 1100°C. Corrosion-resistant cast iron includes alloyed cast iron with high chemical resistance to harmful environments - acid, alkali, etc. Magnesia cast iron - gray (very refined) cast iron containing graphite spheres; by adding magnesium or its alloys to liquid cast iron, cast iron graphite is brought into a ball shape, used for the preparation of parts subject to a large load (power). Non-magnetic cast iron is a multi-alloyed cast iron based on austenite; magnetic permeability is very small; mainly used in electrical engineering. Cast iron pan Cast iron is a carbon alloy of iron (C more than 2.14%). Carbon can be present in cast iron in the form of cementite and graphite. Depending on the form of graphite and the amount of cementite in the composition, it is divided into the following types: white, gray, malleable and high strength cast iron. Cast iron is a brittle material. Cast iron is also taken; the amount of silicon and manganese in such irons is much higher than in ordinary irons. The following types of cast iron are of great importance in mechanical engineering. Aluminum cast iron is cast iron with a large amount of aluminum, it is fireproof and corrosion resistant, it is used as a non-magnetic material in electrical engineering. Anti-friction cast iron - corrosion-resistant cast iron, used for making bearings and other frictional parts. Durable cast iron - strength does not decrease significantly when the temperature rises; cast iron working at high temperature is used for making fittings and other products. Refractory cast iron - shows good resistance to oxidation at high temperatures; this property is created by adding more chromium to it, it is



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used to prepare details working at temperatures up to 1100°C. Corrosion-resistant cast iron includes alloyed cast iron with high chemical resistance to harmful environments - acid, alkali, etc. Magnesium cast iron - gray (very refined) cast iron with spherical graphite; by adding magnesium or its alloys to liquid cast iron, cast iron graffiti is brought into a spherical shape, and is used for the preparation of details subject to a large load (force). Non-magnetic cast iron - multi-alloyed cast iron based on austenite; magnetic permeability is very small; mainly used in electrical engineering.

Cast iron is produced from iron ores and polymetallic ores in metallurgical furnaces (blast furnaces, electric furnaces). In addition to gray and white cast iron, irons called ferroalloys are also obtained in the furnaces; The amount of silicon and manganese in such irons is much higher than in ordinary irons. The following types of cast iron are of great importance in mechanical engineering. Aluminum cast iron is cast iron with a large amount of aluminum, it is fireproof and corrosion resistant, it is used as a non-magnetic material in electrical engineering. Antifriction Cast iron - corrosion resistant Cast iron, bearings, etc. used for the preparation of friction parts. I yee i qbardosh Cast iron - strength does not decrease much when tra is raised; High-voltage cast iron fittings, etc. used to make items. Refractory cast iron - has good resistance to oxidation at high temperatures; this property is created by adding more chromium to it, it is used for the preparation of parts working at temperatures up to 1100°C. Corrosion-resistant Ch. - harmful environments - acid, alkali, etc. belongs to alloyed cast irons with high chemical stability. $P_2O_5 + 5C = 2P + 5CO - Q$. Almost all phosphorus goes to the alloy. It is known that sulfur exists in coke and ore in the form of compounds FeS_2 , FeS , $CaSO_4$, CaS . During the process, about 10 - 60% of S leaves the furnace in the form of SO_2 , H_2S gases. Part of it is in metal and slag (CaS) in the form of $[FeS]$. In order to transfer the FeS dissolved in the metal to the slag, the slag must contain more lime. Only then it binds sulfur (CaS) in the form of a compound: $FeS + CaO + C = Fe + CaS + CO + Q$. Thus, part of the sulfur from FeS in cast iron is transferred to slag in the form of CaS . In this case, the metal is partially purified from sulfur at the expense of MgO and Mn : $FeS + Mg = FeO + MgS$; $FeS + Mn = Fe + MnS$. Slag separation. Limestone ($CaCO_3$) introduced into the furnace as flux decomposes into CaO and CO in the 900°C temperature zone.



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Near the CaO raspar zone, the primary slag combines with SiO₂, Al₂O₃, FeO and other foreign rocks and begins to separate.¹

It flows towards the hearth and heats up at a high temperature, melting coke ash, unburnt oxides and foreign rocks. Slag contains very little FeO. The process of iron recovery and slag formation in a certain sequence depends on the chemical composition of the separating slag and the temperature of the fluidization.

For example, Mn is returned to cast iron. If pig iron containing more Si is obtained, on the contrary, the amount of lime in the slag is less. One of the important characteristics of slag is the mutual ratio of basic and acidic oxides: (CaO + MgO) : (SiO₂ + Al₂O₃) and this ratio should be in the range of 0.9 - 1.4 in the production of cast iron.

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