

# **International conference Metrological support of innovative technologies-ICMSIT-2020**

«The study of influence of chemical composition of steel 35HGSL on the characteristics of shrinkage, casting defects and microstructure»

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# Problem statement

- Today, there are many industrial enterprises that are engaged in the manufacture of parts from metal materials. In order to produce high-quality products, the main operation is to identify certain defects that can later cause the parts to fail. In the manufacture of castings when casting on investment models there are the following reasons for the formation of defects:
  - - insufficient surface cleanliness of molds;
  - - poor wetting of the surface with a special solution;
  - - insufficient surface strength of the shell;
  - - breaking of the first facing layer of the suspension with sand when sprinkling blocks;
  - - formation of cracks in the layers of the mold shell due to its insufficient heat resistance;
  - - formation of air bubbles on the surface of the models and between the layers of the shell due to poor wetting of the surface of the models with a solution;
  - - formation of cracks in the shell under the pressure of the support filler;
  - - chemical activity to the shell material of oxides dissolved in the alloy;
  - - overheating of the metal when pouring into molds;
  - - strong heating of individual sections of the mold cavity;
  - - defects in the Gating system;



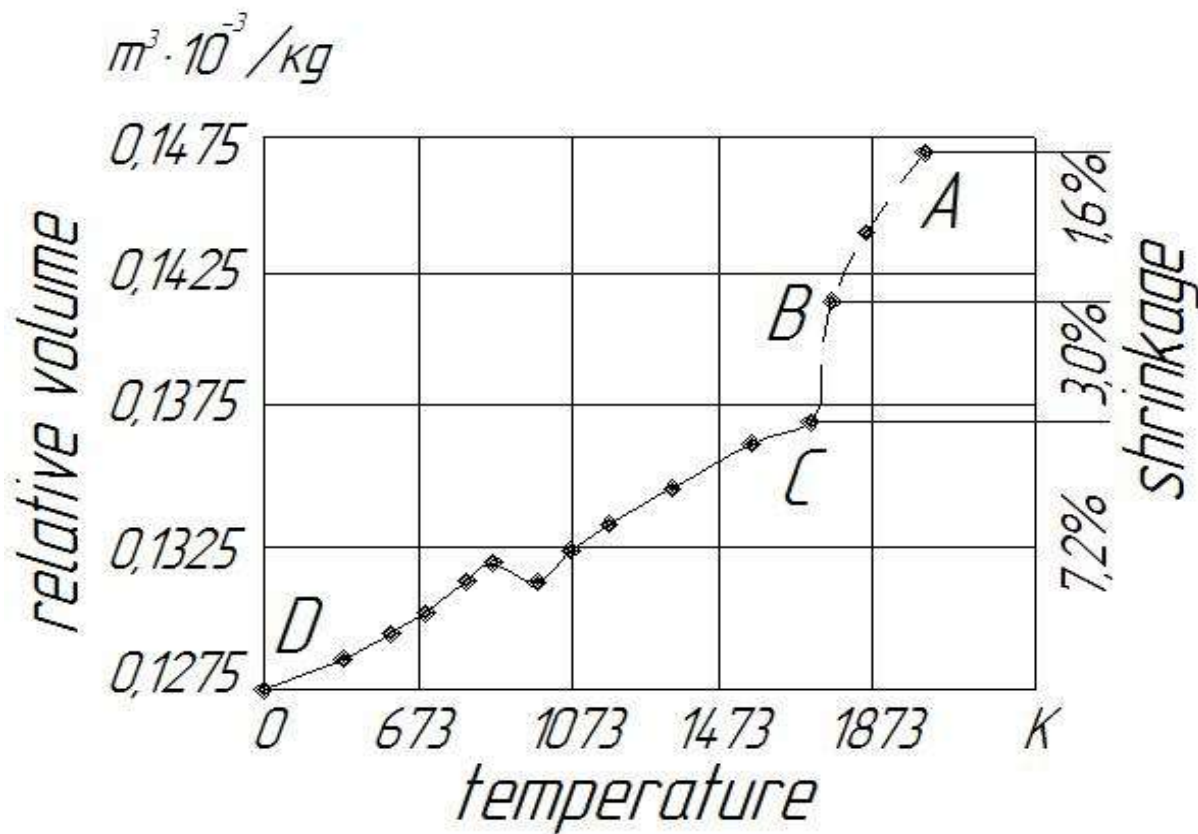
# Solution methods

- The process of crystallization of cast steels is accompanied by the formation and growth of crystals, hydrodynamic phenomena (movement of the melt in the crystallizing casting), heat transfer, compression, gas release, etc.: All this is the cause of various defects.
- The formation of crystals during the transition of steel from a liquid state to a solid state is called primary crystallization. Changing the shape of crystals during polymorphic transformations occurring in the solid state is called secondary crystallization .
- The primary crystallization of steel in the mold depends on many factors: the heating temperature of the liquid metal in the melting furnace, the duration of steel exposure at temperatures higher than the melting temperature, the temperature of the steel when filling the mold, the heat sink conditions in the mold during crystallization, and others.
- In real conditions of obtaining shaped steel castings, the factors that determine the heat sink from the crystallizing casting - the heat storage capacity of the casting mold and the thermal properties of the metal-have the greatest influence.
- In real conditions, there are three zones in the macrostructure of steel castings: the outer zone with small undirected crystals, the middle zone with crystals oriented in the direction of the heat sink, and the Central zone with relatively large and randomly oriented crystals.



# Conclusions

Results, implementation



**Figure 1.** Steel shrinkage Curve with 35HGSL  
 AB - in the liquid state; BC-in the crystallization  
 interval; CO-in the solid state.



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