ON THE ISSUE OF NITROGEN SOLUBILITY IN CHROMIUM-NICKEL GRADES OF STEELS

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The article presents a comparative analysis of the solubility of nitrogen in chromium-nickel grades of steels. It is revealed that the existing theoretical calculations on the solubility of nitrogen in chromium-nickel steels can be applied only to austenitic grades of steels.

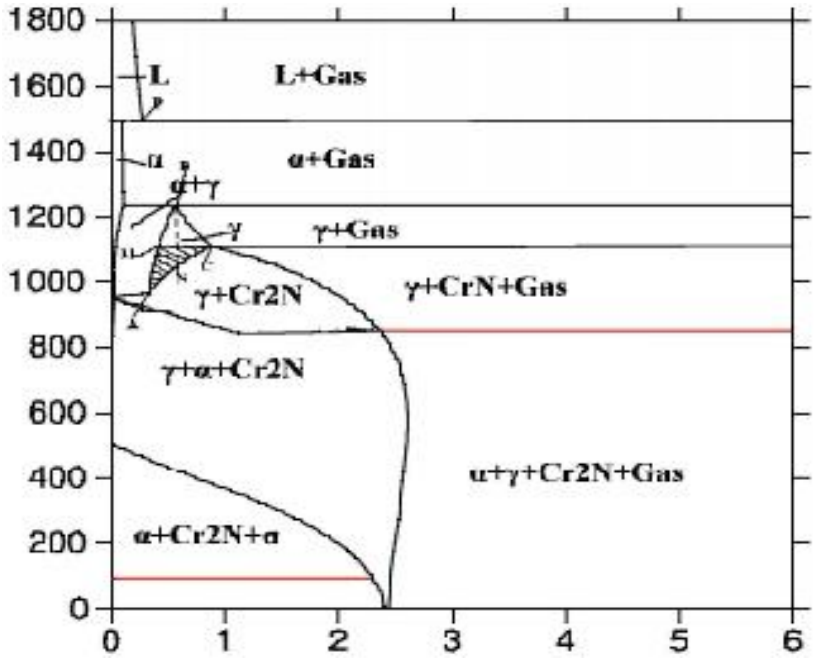

Fig. 1. Polythermal section of the phase equilibrium diagram of the Fe-18%Cr-N system

The paper carried out a theoretical calculation of the solubility of nitrogen in the experimental obtained metal compositions, after which the results were compared with the concentration of nitrogen obtained during the study of the chemical composition of the metal. According to [1], it is possible to carry out a theoretical calculation of the solubility of nitrogen in a melt containing Cr, Mo, Ni and Mn, since these elements have a major influence on the assimilation and, consequently, on the solubility of nitrogen in iron-based melts. The solubility of nitrogen is a logarithmic function that depends directly on the temperature of the melt.

Since the solubility of nitrogen is a temperature-dependent function, this indicator was calculated for different melt interaction temperatures.

During the experiment, it was revealed that the solubility of nitrogen in ferrite is much less than in a liquid melt [2]. If ferrite is formed during the crystallization of steel,

then part of the nitrogen dissolved in the metal is released into the gas phase, while bubbles form in the ingot. The appearance of bubbles increases due to the positive nitrogen liquation in such a structure. The central part of the ingot crystallizes at a noticeably higher nitrogen content than the source metal. At the same time, the solubility of nitrogen in alloyed austenite is much higher than in liquid metal and all nitrogen dissolved at the melting temperature is absorbed without bubbles. The austenite formed during crystallization is enriched with nitrogen, the portions of the metal that crystallize last contain less nitrogen than the source metal. A large difference in the solubility of nitrogen in liquid chromium-containing steel and in α-ferrite also causes the growth of the ingot associated with nitrogen emissions during crystallization.

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