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«THE INFLUENCE OF CRYOGENIC TREATMENT AND SUBSEQUENT ANNEALING STEPS ON THE STRUCTURAL AND PHASE STATE OF 12Cr18Ni10Ti STEEL»

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Problem statement

- Necessary remove internal stress in the metal, increase wear resistance, homogenize the structure, and get rid of retained austenite by turning it into martensite
- Consider the effect of cryogenic treatment and subsequent annealing steps on structural, corrosion-resistant 12Cr18Ni10Ti steel
- Investigate the microstructure of 12Cr18Ni10Ti steel
- Reveal the reverse alpha-gamma transformation after cryogenic treatment and additional annealing

Solution methods

- Test specimens were cut out on an electric spark machine in the form of rectangular plates with dimensions of 15×10×1.5 mm. The surface layer on the samples, which was damaged during cutting, was removed by dry cleaning in a solution: 2 parts HNO3 + 3 parts HCl. Then the samples were subjected to mechanical grinding and electrolytic polishing in a solution of 25 g. CrO_3 + 210 ml H_3PO_4.
- Methods:
  - X-ray diffraction
  - Electron microscopic

Conclusions

Results, implementation

- Thus, after cryogenic treatment, the steel had a martensitic structure with a martensite plate size of 180 nm. Subsequent annealing of the samples after cryogenic treatment leads to the reverse alpha-gamma transformation and the formation of a recrystallized structure with different austenite grain sizes.
- The detected difference in the lattice parameters, as well as the ratios of the intensity of the diffraction maxima in comparison with the tabulated data for α-Fe, may indicate that:
  - - the lattice of α-Fe steel after cryogenic treatment is oversaturated with carbon, i.e. it is a martensitic phase;
  - - the steel after cryogenic treatment is not isotropic but textured.
  - The carbon oversaturation of the α-Fe lattice is small because the separation of the first peak is not clear. For a complete analysis of 12Cr18Ni10Ti steel, only X-ray data are insufficient; for a more accurate description…

Contacts

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