Arc-plasma remelting of steel

Sargsyan M A[@], Ilichev M V, Tyuftyaev A S, Yusupov D I and Gadzhiev M Kh

Joint Institute for High Temperatures of the Russian Academy of Sciences, Izhorskaya 13 Bldg 2, Moscow 125412, Russia

[@] m.sargsyan86@mail.ru

Low-temperature plasma is widely used in science and technology, in particular, for alloying steels with nitrogen during arc remelting, which is one of the most promising directions for creating high-strength, corrosion-resistant high-alloyed steels. The use of nitrogen in the gas phase makes it possible to obtain steel with a higher and more uniform nitrogen content, and the use of nitrogen plasma makes it possible to quickly obtain the required nitrogen content in the alloy due to the active absorption of nitrogen by the liquid metal, which exists in an excited and atomic state. To study the process of alloying steel with nitrogen, an experimental stand for plasma-arc remelting of steel was created, based on a vertically located low-temperature plasma generator with a direct arc. The physicochemical properties of both the plasma medium itself were determined (in the axial zone, the temperature and concentration of electrons 7000 K and 10^{16} cm^{-3}, respectively) as well as the properties of the resulting metal after remelting of steel grade 55Kh20G9N4. In which changes in the following properties were established: grain refinement, increase in strength, plasticity, total work of destruction, wear resistance under dry friction conditions and a decrease in the corrosion rate.

The present work was partially supported by the Russian Foundation for Basic Research (grants No. 19-08-0100 and 20-08-00224).