MODELING OF GAS-SHIELDED AREA FOR WELDING PROCESSES

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Metal is often used in the Arctic to construct buildings of various designs. Metal constructions show themselves as the most reliable at low temperatures. It is a frequent case when building such constructions needs welding. To obtain the latter one of high-quality it is necessary to define what conditions would make it of the highest quality.

Contact of molten metal with the air causes oxidation of the metal and dissolution of nitrogen and hydrogen in it. It causes pores and cracks in the weld reducing the plasticity of the weld and worsening the construction's operability.

Protecting the welding zone from atmospheric air is a necessary condition for high-quality welds for all electric-arc welding methods.

There are many ways of defence. Welding in protective gases is one of the most common types of welding. It is widely used in all industrialized countries of the world as it makes it relatively simple to mechanize processes.

When welding titanium, the feature of which is high reactivity at temperatures above 600°C, the inert gases argon and helium are applied. When welding steel, carbon dioxide and its mixtures with other gases is most commonly used [1].

In the article we consider a process of flowing in the shield jet and the associated with it the issue of size and sustainability of the protection zone created by this jet. The issue is discussed within the limits of the significant restrictions that simplify the problem.

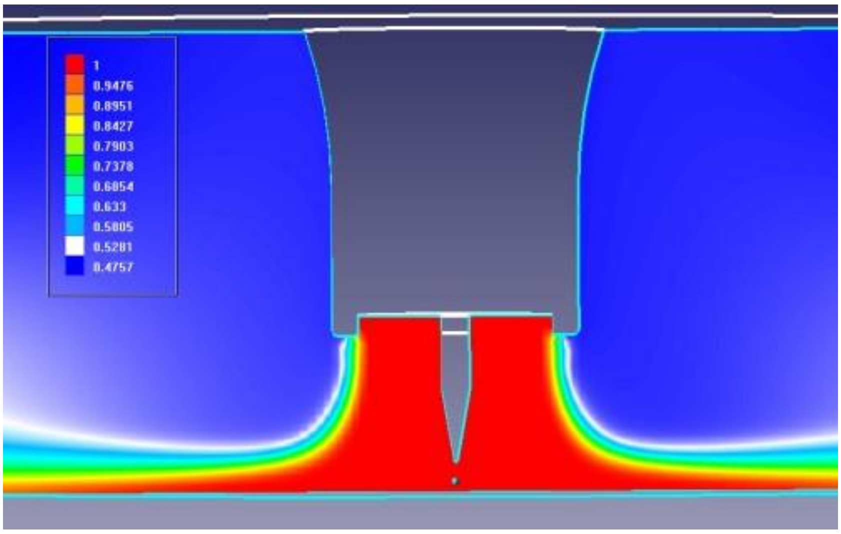

Fig. 1 Flow lines from the inlet

One of these limitations is that we of necessity are forced to exclude the thermal influence of the welding arc and incandescent metal on the gas flow from consideration.

In other words, one makes an assumption that the protective jet moves under isothermal conditions.

Another limitation concerns the quality of the jet. In technical and scientific literature jet flows are most often considered; by default their characteristics correspond to some conditional quality standard. We call these flows perfect.

In real conditions obtaining perfect jet is arduous. The quality of the jets depends immensely on what gas flow was inside the gas burner, and this dependence appears differently at different Reynolds numbers [2].

As for the possibility of conducting these studies, unfortunately we have to state that the traditional methods of computational mathematics are useless to fulfill these studies even for a perfect jet under isothermal conditions. A mathematical simulation of the protective jets by means of modern computers provides solution to this specific problem of gas dynamics.

1. Potapievsky A.G., Welding in carbon dioxide, Mashinostroenie (1984).
2. Fedorenko G.A., Theory of gas protection while arc welding in protecting gases, Intermet Engineering (2012).

МНОГОСЛОЙНЫЕ НАНОСТРУКТУРЫ Mg/NbO

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MULTILAYER Mg/NbO NANOSTRUCTURES

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Annotation. Multilayer $(Mg/NbO)_{82}$ nanostructure has been obtained by ion-beam sputtering of two targets and subsequent deposition on the rotating substrate. Thickness of each layer in the obtained structure as well as resistivity dependence on the bilayer thickness have been measured.

Получение многослойной наноструктуры осуществлялось методом одновременного ионно-лучевого распыления двух мишеней: металлической (Mg) и диэлектрической (Nb_2O_5) с последующим осаждением материала на подложки, совершающие круговое движение вокруг мишеней. Многослойная структура $(Mg/NbO)_{82}$ (индекс 82 означает количество бислоёв Mg/NbO) получена при осаждении магния на подложку через V-образный экран, в то время как осаждение оксида ниобия осуществлялось без использования экрана. Вследствие этого полученные многослойные образцы отличались друг от друга толщиной магниевой