Study of the Technological Possibilities of the Large Sole Furnace in Localization of Imported Electric Heaters

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Abstract. In this article, you will get acquainted with the most popular and probably unfamiliar electric heaters, their types, and modes of operation. You will also learn about the process of making electric heaters imported to date based on solar energy. Where and why electric heaters are used, their functions, you will be able to use a local product that completely replaces the imported product.

Keywords: kata solar oven, electric heaters, silicon carbide, chrome lanthanum

INTRODUCTION

The problems discussed in this article lead to the problems of ensuring a stable mode of operation of electric heaters, increasing the speed of production and reducing power losses, thermal engineering processes, the relationship between the parameters of the base area. In this article, based on a review of the ability of electric heaters to heat up to 1700^0C, the dynamics of temperature change and the maximum operating temperature in each part of the electric heater are determined, depending on their duration. The characteristics of the obtained results and the optimized state of their application in high-temperature electric furnaces are of interest. This article will help to expand the concepts in distinguishing the types of electric heaters from each other.

METHODS

Particular attention is paid to the development of new types of high-temperature electric heaters, which is one of the most promising directions in the rapidly developing ceramics industry in the world today, as well as the improvement of high-temperature electric heaters based on carbide silicon and chrome-lanthanum. In this regard, the principle of operation of electric heaters is one of the important tasks in creating a new type of improved requirements for the strength of external influences on heat, maintaining its condition and varying levels of color. In the world of ceramics today, great importance is attached to determining the role of their parameters in the formation of the physical properties of electric heaters. In this regard, the implementation of targeted research, including scientific research in the following areas, is an important task, which includes: a thorough study of physical processes occurring in the structures under study and identification of mechanisms for the formation of resistant characteristics; improvement of technological methods of production of all-round convenient heat-resistant electric

heaters; to determine the spectral characteristics of heterostructured electric heaters based on carbide silicon and serpentine in relation to hetero boundary processes; search for ways to optimize their functional parameters, and improving the technology of their preparation. According to the Action Strategy for the further development of the Republic of Uzbekistan, special attention is paid to the creation of effective mechanisms for the implementation of scientific and innovative achievements. In particular, one of the important tasks is to study in practice the ability to control the various processes and spectral characteristics of electric heaters in heterostructures. It is noteworthy that the Year of Active Entrepreneurship, Innovative Ideas and Technology Support brings the scientific results to a level that meets modern requirements. In this regard, it is important to increase their efficiency by optimizing the functional characteristics of heterostructure electric heaters for different spectral ranges. Methods have been developed to reduce the effects of radiation and ultrasound on the internal effects of electric heaters. In this regard, it is important to determine the processes that explain the formation of spectral characteristics, dynamic and static characteristics of heterostructural ceramic plates based on carbide silicon and chrome-lanthanum, increase the efficiency of technical parameters and develop new technologies for their creation.

Chromite lanthanum-based ($LaCrO_3$) electric agitators have different properties and configurations in high-temperature industrial and laboratory electric furnaces. In room-temperature electric ovens, they provide a temperature of 1700-1800^{o}C. [1-3].

The results of our research based on a large solar oven in collaboration with the Institute of Materials Science of the Physics-Sun Research and Production Association of the Academy of Sciences of Uzbekistan and the Tashkent Institute of Irrigation and Agricultural Mechanization Engineers. The following types of electric screwdrivers are manufactured and sold. Electric agitators can also be used in other environments. Chromite is the least aggressive substance compared to lanthanum, inert gases (argon, helium), nitrogen, carbon dioxide when the atmosphere is heated to 1200^{o}C. When the reduced oxygen pressure is less than 100 Pa, an operate in this gaseous medium at a temperature of 1400^{o}C. [4-5].

K-type

L-

Conveniences:

easy and quick replacement;

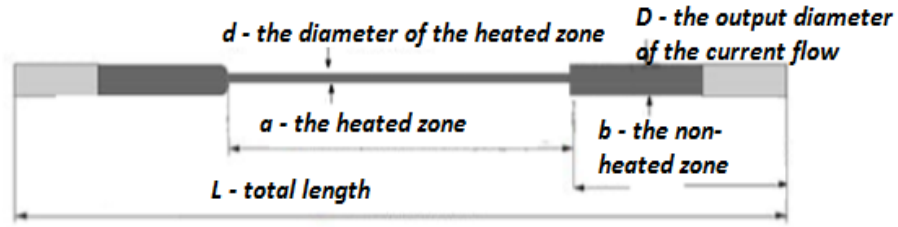
continuous and cyclic operation;

heating to 1800^{o}C in an oxidizing atmosphere;

stability of electrical properties during operation (no aging) - old and new h together;

Ability to work in the entire temperature range (from room to maximum).

Types of high-temperature chromite lanthanum-based electro waggers



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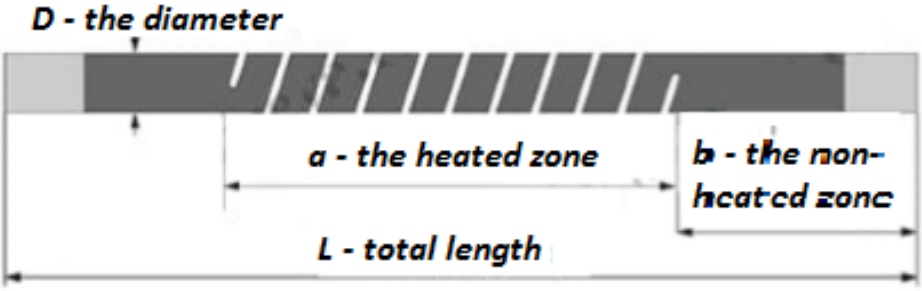

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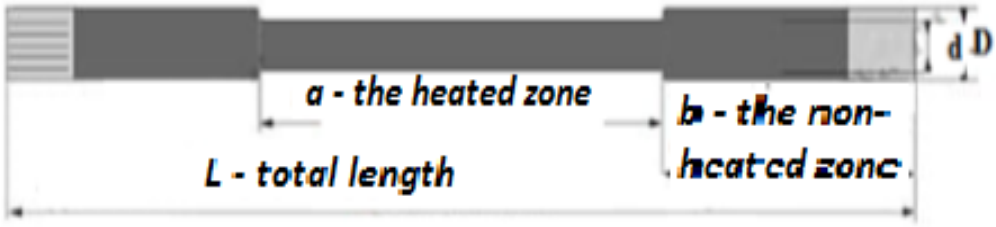

c)

FIGURE 1. Technological scheme of electric heater.

The S-type chromite lanthanum electric screwdriver is a tubular element with a spiral working part. Due to the geometric properties, the resistance of the central part of the spiral is much greater than that of the outer part, which ensures the most efficient redistribution of the generated heat along the length of the element.

The operating temperature of S-type electric agitators is 1700°C. The working area of the T-shaped chromite lanlan-based nagrevatell is slightly thicker than that of the K-type, so the maximum working temperature is 1800°C. Chromite lanthanum-based high-temperature electric heating elements are made of ceramic material, conductive and resistive heating directly from room temperature.

Structurally, these chromite lanthanum heaters are made in the form of wires and pipes of various sections and configurations, which have a metallized coating at the end to connect the electrical contacts.

Chromite lanthanum-based heaters are used in air-operated electric resistance furnaces and provide thermal processes at temperatures up to 1700^0C, and in some cases up to 1800^0C. The heaters can be used for continuous and intermittent operation, with complete cooling between cycles. Chromite lanthanum-based heating elements can be easily replaced, which reduces production losses.

The following technologies are used in the industrial production of this type of heater:

- Large and small functions of the ceramic mass are synthesized by the addition of lanthanum oxide and chromium, followed by the addition of calcium. All of these chemical elements are brought into the same state;
- then from the prepared fractional mass are formed ceramic pipes with flow wires;
- The pipes are heated in a high-temperature industrial electric furnace, which allows the heater to be one unit. The length of this product is up to 1500 mm and longer. The voltage in the supply network can be used for any network, but mainly 220, 380 Volts. The maximum temperature of such elements is up to 1800^0 Degrees.

Element installation and operation.

1. For each element, a certain resistance must be selected before installation to maintain the oven temperature and the mounting device. The value deviation should not exceed ± 10% of the resistance of the electric heaters in the kit.
2. As the element is very delicate, be careful during installation and use to avoid damage.
3. When starting the oven, increase the voltage slowly and gradually, never fully load at once, otherwise the heating element will be damaged.
4. Silicon carbide electric heater works with both alternating current and direct current, adjusting transformer or silicon control transformer, voltmeter, ammeter, automatic control thermometer and so on to use the element. During operation, the voltage must be increased to maintain the normal temperature of the furnace, as the resistance value gradually increases due to the oxidation of the element. When the voltage reaches the extreme point of the transformer and the temperature is still lower than required, the furnace must be stopped, the method of connecting the heaters (in parallel, in series or in series - in parallel) and then continue to operate.
5. During long operation of the oven, if for some reason any individual element is damaged, it should be replaced with a heater whose resistance value corresponds to the old one, never use a new heating element accidentally. If the heating element is severely damaged or its resistance value is too high and cannot reach the oven temperature, then it is better to replace all heating elements with new ones. Measure the resistance value of the old elements (they will be replaced) and place them in a lower temperature area.
6. Before using a new oven or an oven that has not been used for a long time, it should be dried before starting work. You can use old elements or other heat sources to dry.
7. When switching on the appliance (oven) or material, if water leaks, the oven should have holes for the release of water vapor or other unwanted gases, to protect the heating elements and to increase the service life.

CONCLUSION

The connection diagram of the heaters determines the stability of their electrical properties. When heaters are connected in parallel during operation, the differences in resistance value are reduced because heaters with lower resistance circulate with greater current. These heaters age faster and the resistance increases. Therefore, the parallel connection of the elements is preferable to the series, in which the difference in resistance values increases due to the intensive aging of the heaters with high resistance. When connected in parallel, the distribution of the resistance of the electric heaters in the set shall not exceed ± 10% of the average resistance value of the set; when connected in series, this difference should not exceed ± 5%. When designing and operating electric furnaces with silicon carbide electric heaters, the effect of the temperature control method on the cycle must be taken into account. Heater maintenance. Constant temperature control leads to an increase in the service life of the heaters compared to the position temperature at the same temperature in the electric oven, and therefore a continuous method of controlling the temperature of the electric oven is preferred. [7]

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