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HERMOELECTRONIC WIRES AND RESISTORS FOR SYSTEMS THAT AUTOMATICALLY CONTROL THE TEMPERATURE OF ENVIRONMENTS AND MOLES FOR SCIENTIFIC PURPOSES

Annotation: the wires connecting a thermoelectric thermometer with an electronic measuring instrument are made from such materials that their pair forms an EYuK corresponding to the temperature of the environment in which the thermometers themselves are connected. Such a requirement is limited by a temperature of about 1000 C. at a temperature higher than this, the descriptions of the thermoelectric thermometer and the wires connecting may differ from each other [1]. This is allowed to happen because the temperature of the wires connecting is usually not high. When the specified requirements are met, the thermocompensation wires extend to the length of the wires connecting the length of the thermoelectric thermometer (thermoparah), while the free ends of the thermoparah remain directly on the clamps of the instrument intended to measure the electric driving force EDF.

Key coils: thermoelectric thermometer, electric driving force, temperature,thermoelectric wire, resistance, difference

Introduction

The wires connecting a thermoelectric thermometer with an electronic measuring instrument are made from such materials that their pair forms an EDF corresponding to the temperature of the environment in which the thermometers themselves are connected. Such a requirement is limited by a temperature of about 100 The wires connecting a thermoelectric thermometer with an electronic measuring instrument are made from such materials that their pair forms an EDF corresponding to the temperature of the environment in which the thermometers themselves are connected. Such a requirement is limited by a temperature of about 1000 C. at a temperature higher than this, the descriptions of the thermoelectric thermometer and the wires connecting may differ from each other [1].

Materials and methods:

This includes empirical methods such as modeling, fact-finding, experiment, description and observation, as well as theoretical methods such as logical and historical methods, abstraction, deduction, induction, synthesis and analysis, as well as methods of heuristic strategies. The research materials are: scientific facts, the results of previous observations, surveys, experiments and tests; means of idealization and rationalization of the scientific approach.

This is allowed to happen because the temperature of the wires connecting is usually not high. When the specified requirements are met, the thermocompensation wires extend to the length of the wires connecting the length of the thermoelectric thermometer (thermoparah), while the free ends of the thermoparah remain directly on the clamps of the instrument intended to measure the EDF. Failure to comply with the above requirement can lead to the formation of a “parasitic” TEYuK as a result of the appearance of sutures in places that connect the free ends of the thermopar with measuring wires. If the attenuating wires have the same leveling detail as the thermometer's, the “parasite” is divided to get rid of EDF formation [2].

The extension thermoelectric wires are made single and multi-wire, insulated and made with an external coating or shell, which is convenient for mounting and laying. For insulation, polyvinyl chloride, polyethylenterephthalate and fluoroplast coatings are used. In addition to insulation, wires are often wrapped rotting with a polyvinyl chloride shell, lavsan thread, or glass thread [2].

If it is required to avoid an external electrical magnetic field and mechanical impact, then copper, steel wire (GOST 24335-80) coating or screens are applied.

The attenuating thermoelectrode wires in each category will have a specific color of insulation material, or the color of the sheath and sheath itself, Table 1 lists thermoparas, recommended attenuating thermoelectrode wires, their markings and colors [1].

Results and discussion:

Emitting thermoelectrode wires for thermoparticles ^{0}C. at a temperature higher than this, the descriptions of the thermoelectric thermometer and the wires connecting may differ from each other [1]. This is allowed to happen because the temperature of the wires connecting is usually not high. When the specified requirements are met, the thermocompensation wires extend to the length of the wires connecting the length of the thermoelectric thermometer (thermoparah), while the free ends of the thermopEDF. Failure to comply with the above requirement can lead to the formation of a “parasitic” EDF as a result of the appearance of sutures in places that connect the free ends of the thermopar with measuring wires. If the attenuating wires have the same leveling detail as the thermometer's, the “parasite” is divided to get rid of EDF formation [2].

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The electrical resistance of conductors or semiconductors is a function of the temperature in IT R=:(t). Measurement of temperature with resistance thermometers is based on the functional connection between temperature changes and changes in electrical resistance of conductors and semiconductors. The electrical resistance of most pure metals increases with increasing temperature, while the resistance of metal oxides (semiconductors) decreases. In the preparation of resistance temometers, pure metals are used that meet the following requirements.

1. In the environment being measured, the metal should not oxidize and the chemical composition should not change.

2. The temperature resistance coefficient of the metal should be sufficiently large and stabilized.

3. The resistance should change sharply in a straight or smooth curve without deviations and cases of hysteresis with temperature

$$a = \left(\frac{1}{R_0}\right) \cdot \left(\frac{dR_1}{dt}\right) \tag{1}$$

in this: R0 and Rt – electrical resistances at a temperature of 00 S and t0S, respectively.

The unit temperature coefficient is expressed in 0S-1 or K-1s. For most pure metals, the temperature coefficient lies at 0.0035 - 0.065 K-1 limits. For semiconductor metals, the temperature coefficient is negative and one order more than that of metals (0.01 - 0.15 K-1).

Copper, platinum, nickel and iron are used to make resistance thermometers. Copper is a relatively inexpensive material whose resistance is linearly dependent on temperature [2], i.e.:

4. The specific electrical resistance should be large enough.

In the range of known temperatures, metals such as platinum, copper, nickel, iron, volpfram meet the above requirements.

The parameter describing a certain temperature-dependent change in electrical resistance is called the temperature coefficient of electrical resistance.

The temperature coefficient of metals whose electrical resistance depends on temperature can be determined with one value per temperature [2]: $R_t=R_0(1+a_t)$, (2)

bunda: R_t va R_0 – mos holda t va 0^0S haroratlarda termometrning qarshiligi; α - mis simning harorat koeffitsiyenti; $\alpha=4{,}28\cdot10^{-3}K^{-1}$.

Due to the high oxidation of copper, thermoparas made from it are used to measure temperatures of no more than 2000s. The nominal resistors of resistance thermometers, usually made of copper, are 10; 50 and 100 ohms at $0\ ^0$S, and are applied to measure temperatures from –200 ^{0}S to +200 ^{0}S over a long period of time. They are produced by precision classes II and III. The smallness of the copper comparative resistance ($\delta=0{,}17\cdot10^{-7}$ Om·m) is its disadvantage, since the less the comparative resistance, the more wire is needed, which in turn affects the dimensions of the thermometer. Therefore, the dimensions of copper thermometers will be relatively large. [2]:

Platinadan tayyorlangan qarshilik termometrlari -260^0S dan $+1100^0$ S gacha haroratlarni o`lchash uchun qo`llaniladi. Platina - qimmatbaho material. Kimyoviy jihatdan inert modda bo`lib, sof holda osonlik bilan olinadi. Platinaning elektr qarshiligi bilan harorat o`rtasida murakkab bog`lanish bo`lib, -183^0 S dan 0^0 S gacha bo`lgan harorat oralig`ida quyidagicha yozilishi mumkin [2]:

Platinum resistance thermometers-applied to measure temperatures from ----260 ^{0}S to +1100 ^{0}S. Platinum is a valuable material. Chemically an inert substance, it is easily obtained in its pure form. There is a complex connection between the electric resistance of platinum and the temperature, which can be written in the temperature range from -183 ^{0}S to 0 ^{0}S as follows [2]:

$$R_t = R_0 \left[(1+At+Bt^2+Ct^3(t-100)\right], \quad (3)$$

From 0 ^{0}S to +630 ^{0}S, the interval is:

$$R_t = R_0 (1+A_t+Bt^2) \quad (4)$$

is expressed in terms of. Where: R_t and R_0 are the electrical resistance of Platinum at temperatures t and 00s, respectively; a, V, s are constant coefficients whose values are determined by the boiling points of oxygen, water and sulfur when rating the thermometer.

Semiconductors (oxides of some metals) are also used to make resistance thermometers (thermistors). A significant advantage of semiconductors is the magnitude of the temperature coefficient in them. In the preparation of thermocouples, crystals of titanium, magnesium, iron, manganese, cobalt, nickel, copper oxides or some metals (for example, germanium) are used in combination with various mixtures. The connection between the thermometric resistance of the semiconductor (thermoresistor resistance) and the temperature can be expressed as follows [2]:

$$R_m = R_0 \cdot exp(B\frac{T_0 - T}{T_0 \cdot T}) \quad (5)$$

where: R0 is the thermometric resistance of a semiconductor at temperature T0; V is the coefficient specific to the material of the semiconductor from which the thermometer is made.

Germanium thermoresistors are common in industrial production to measure temperatures of 1.50 K and above, with oxidizing semiconductor materials used to measure temperatures ranging from -100 ^{0}S to +300 ^{0}S.

Conclusion:

Thermostats of MMT-1, MMT-4, MMT-6, KMT-1, KMT-4 are also used in temperature measurement. Semiconductor thermoresistors are more commonly used in thermosignalization and automatic protection devices. The types, basic parameters and sizes of resistance thermometers produced in industry are determined by state standards (GOST 6651-78) [3,4].

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