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THE USE OF SPECTRAL INSTRUMENTS AND ANALYSIS METHODS IN BIOLOGICAL, BIO-CHEMICAL, MICROBIOLOGICAL, GEOLOGICAL AND THERMO-TECHNOLOGICAL RESEARCH

Annotation: the process of thermal radiation consists in the propagation of the internal energy of a radiating body in the manner of electromagnetic waves. When these waves are absorbed by other bodies, they are again reflected back into thermal energy. The bodies propagate electromagnetic waves of wavelengths from 0 to. Many of the solid and liquid bodies have an unattractive spectrum of radiation, that is, they emit waves of all lengths. The principle of operation of radiation pyrometers is based on the measurement of the energy of radiation generated by the heat of the heated body itself. Radiation pyrometers are used to measure temperatures ranging from 20 ^{0}S to 6000 ^{0}S.

Key cots; temperature, wave, radiation, spectrum, pyrometer

Introduction

All thermometers designed to measure temperature are assumed to have direct contact between the body or medium being measured by the sensitive element of the thermometer [1]. Therefore, such methods of temperature measurement are sometimes referred to as contact methods. The upper limit for the use of this method is 18,00 ^{0}S - 20,00 ^{0}S. But in industry and scientific research it is also necessary to measure temperatures higher than this. In addition, it is often impossible for a thermometer to be in direct contact with the body and environment being measured. In such cases, non-contact means of temperature measurement are used.

The principle of operation of radiation pyrometers is based on the measurement of the energy of radiation generated by the heat of the heated body itself. Radiation pyrometers are used to measure temperatures from 200 S to 6000 ^{0}S [2].

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 approac

The process of thermal radiation consists in the scattering of the internal energy of the radiating body in the manner of electromagnetic waves. When these waves are absorbed by other bodies, they are again reflected back into thermal energy. The bodies propagate electromagnetic waves of wavelengths from 0 to. Many of the solid and liquid bodies have an unattractive spectrum of radiation, that is, they emit waves of all lengths. Other bodies (pure metals and gases) have a selective spectrum of radiation, that is, they emit waves that belong to a specific area of the spectrum. The wavelength of the spectrum =0.4 from the =0,76 pm mkm area of the visible light will come on. Each wavelength of the visible spectrum corresponds to a specific color.

Results and discussion:

Infrared thermal rays of the spectrum with a length of S / >0.76 μm are invisible.

As the temperature of a heated body is increased, its color changes, in which spectral energetic clarity, that is, waves of a certain length (clarity), quickly increases, as well as cumulative (integral) radiation increases significantly. The indicated properties of heated bodies are used to measure their temperature. Depending on these properties, radiation pyrometers are divided into quasimonochromatic (optical), spectral ratio (color), and full radiation (radiation) pyrometers.

Theoretically, an absolute black body can be based on a phenomenon of light emission, in which the coefficient of light emission is taken to be equal to 1. If an object completely absorbs the energy of the light falling on it, this object is called an absolute black body. All real physical bodies have the ability to repel some of the Rays falling on them. Therefore, the absorption coefficient of light of an object is less than one, at the same time it depends on the nature of a particular object as well as its shallow States. In nature, there is no absolute black body, but in its properties there are objects that are close to the absolute black body. For example, a body covered with black Ghadir-budir paint (oil dry) absorbs up to 96% of the energy of the light that falls on it.

Spectral energetic clarity and integral radiation depend on the physical properties of a substance or environment. Therefore, the pyrometers scale is graded by Absolute Black body radiation. The increase in spectral energetic clarity with increasing temperature is different for waves of different lengths and is characterized by the Vin equation for an absolute black body in the area of relatively low temperatures [2]:

$$E_{0\lambda}=S_{1\lambda}{}^{-5}e^{-\frac{C_2}{\lambda T}} \quad (1)$$

in this case: E_0 is the spectral energy clarity of an absolute black body for a wave of length λ in a given body, e.g.; T is the absolute temperature; S_1 and S_2 are the values of the constants of radiation dependent on the system of received units, i.e. $S_1=2\pi hS^2$, h is the Planck Constant, s is the speed of light; ; $S_2=NhC/R_r{}^2$, n - Avogadro constant, R_r is the Universal Gas Constant;

Since the spectral energetic clarity of waves of different lengths is not the same, the Vin equation is used in optical pyrometry in the field of waves of certain lengths (usually for red with a wavelength of 0.65 or 0.66 μm). The Vin equation can be used for temperatures up to about 3000 K. At even higher temperatures, the intensity of the radiation of an absolute black body is expressed by the Planck equation: $Ye_{0\lambda}=S_{1\lambda}^{-5}(ye^{-\frac{c_2}{\lambda T}}-1)^{-1}$ (2)

The integral radiation of an absolute black body is described by the Stefan-Bol'tsman equation:

$$E_0 = C_0\left(\frac{T}{100}\right)^4 \quad (3)$$

where: C0 is the radiation constant of an absolute black body; T is the absolute temperature of the radiating surface, K.

Real physical bodies radiate energy with less intensity than an absolute black body. As a result of measuring the temperature with a quasimonochromatic pyrometer or with a full radiation pyrometer, the so-called conditional temperature (clarity temperature) is divided by the so-called temperature. The Vin equation is used to move from a conditional temperature to a real temperature [3,4].

Conclusion

In terms of the light temperature TR measured using a quasimonochromatic pyrometer of a physical body, the value of its actual temperature T is represented by the following equation [2]:

$$T = \left(\frac{1}{T_R} - \frac{\lambda}{C_2} In\frac{I}{\varepsilon\lambda}\right)^{-1} \quad (4)$$

in this: TR is the clarity (conditional) temperature of a body measured using a pyrometer, K; λ - wavelength, mkm;; S_2 is the constant of the VIN equation; C - the degree of blackness of the body for a given wavelength.

The full value of the Real body temperature T is expressed by the formula:

$$T = T_y \sqrt[4]{\frac{1}{\varepsilon}} \qquad (5)$$

in this: T_u is the conditional temperature measured by the pyrometer of full radiation; ε - for waves of all lengths, the degree of blackness of the body [1].

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