DIGITAL SYSTEM FOR THE COLLECTION AND PROCESSING OF INFORMATION AND MANAGEMENT OF THE THERMOPHYSICAL HIGH TEMPERATURE INSTALLATION

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The installation implementing the well-known method of temperature waves [1], the main functional devices of which operate under the control of a computer and microcontrollers, is described. The unit consists of an optical quantum generator (laser), an amplitude modulator, a vacuum chamber for the test sample, equipped with electrothermal equipment and a gas supply system, as well as measuring sensors and a digital signal processing system. The modulator transforms the radiation of continuous-wave laser into a stream of thermal pulses acting on the surface of a flat sample. A temperature wave is excited in the sample. The operation of the amplitude modulator is rigidly connected with the operation of the reference voltage generator, which generates a signal that allows to judge the phase of oscillations of the heat flow. The modulation frequency is set at the command of the computer in the range from 1 to 100 Hz and stabilized [2]. The temperature wave passes through the sample. Fluctuations in the temperature of the second flat surface of the sample with the help of a thermocouple and a photo sensor are converted into electrical signals, which, after passing through the analog normalizing circuits, enter the analog-to-digital Converter (ADC), and then into a computer. The operation of the normalizing circuits is controlled by the computer [3], so that the ADC aperture is used effectively. The computer performs Fourier transform signal and reference voltage, which allows you to determine the phase shift of the signal and its amplitude. According to these parameters, the computer calculates the thermal diffusivity and relative heat capacity of the sample. The heating rate of the sample is controlled by a computer, so the entire measurement process takes place automatically.

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