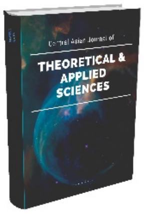

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Optoelectronic Device for Control of Concentration of Gaseous Substances

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Abstract: *A block diagram of an optoelectronic device for monitoring the concentration of gaseous substances is presented. On the basis of the principle of operation of the proposed optoelectronic device lies a two-wave method in which the controlled object is irradiated with two antiphase rectangular pulse trains with wavelengths lying in the absorption maximum of the controlled component (measuring) and not in the maximum absorption by this component (reference).*

KeyWords: *optoelectronics, concentration, gaseous substance, control, absorption, emitting diode, photodetector, controlled object, reference radiation flux, measuring radiation flux, infrared range.*

One of the important parameters of many technological processes is the control of the concentration of gaseous substances. Work on the improvement and development of new devices for monitoring the concentration of gaseous substances is being carried out in our country and abroad.

A wide front of research in the field of measuring the concentration of gaseous substances is stimulated by the practical requests of the chemical and oil industries of the republic for express and highly sensitive methods of devices for monitoring the concentration of gaseous substances [1-10].

One of the promising areas is the optical methods of gas analysis, as evidenced by the large flow of articles in various specialized sources of information. Optical methods of gas analysis are based on the properties of gaseous substances to absorb infrared radiation of a certain wavelength.

The presence of characteristic absorption bands of gaseous substances in the IR spectral region of the optical range allows the development of devices for continuous monitoring of the concentration of various gaseous substances in technological processes [11-23].

For continuous monitoring of the concentration of gaseous substances in technological processes, we have developed an optoelectronic device, the block diagram of which is shown in Fig. 1.

The device works as follows. The master clock generator MG generates a sequence of rectangular pulses with a sufficient repetition rate. These pulses from the output of the master generator MG are fed to the counting input of the trigger T1.

From the antiphase outputs of the T1 trigger, the pulses are fed to the input of the linearly increasing voltage generator RG and the rectangular pulse shaper PS.

An emitting diode ED1 is connected to the output of the generator of linearly increasing voltages, emitting at a measuring wavelength, and an emitting diode ED2, emitting at a reference wavelength, is connected to the output of the square-wave generator.

The radiation of the emitting diodes, proportional to the currents flowing through them, is directed to the controlled object of the CO. Passing through the object, the radiation fluxes at the measuring and reference wavelengths are directed to the photodetector PH.

Alternating radiation pulses at the measuring and reference wavelengths, modulated in a linearly increasing and rectangular form, respectively, cause a signal on the photodetector. The signal from the photodetector goes to the input of the photoelectric signal amplifier AMP, where the signal is amplified, and from the amplifier output the signal is fed to the inputs of the analog switches AS1 and AS2.

When a rectangular pulse appears, which corresponds to the reference radiation molasses, the first analog switch AS1 opens with a control signal from the output of the PS shaper and passes a rectangular pulse to the memory circuit for storing the maximum level MC.

When a linearly increasingpulse appears, which corresponds to the measuring radiation flux, the second analog switch AS2 opens with a control signal from the corresponding output of the T1 trigger and passes a ramp pulse to the non-inverting input of the TD threshold device.

The inverting input of the threshold device TD receives a signal from the output of the memory circuit for storing the level MC.

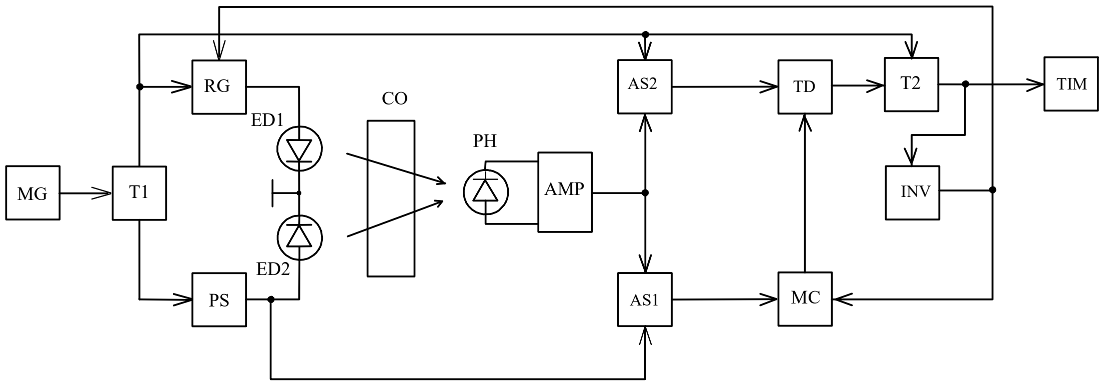

Fig.1. Block scheme of an optoelectronic device for monitoring the concentration of gaseous substances

When comparing the linearly rising pulse with the level stored in the memory circuit MC, a pulse is formed at the output of the threshold device TD, which is fed to the "reset" input of the T2 trigger.

Formed at the output of the trigger T2 through the inverter INV is fed to the "Reset" input of the memory storage device MC and to the input of the shaper of linearly increasing pulses RG.[11-23]

As a result, the discharge of the capacitor of the memory storage device MC and the RG shaper of linearly increasing pulses occurs.

T2 trigger is periodically cocked by the corresponding pulse front from the T1 trigger output. The T2 trigger output is connected to the timeintervalmeasurements TIM.

The duration of the output pulse of the T2 trigger is proportional to the ratio of the radiation flux passed through the controlled object at the reference and measuring wavelengths.

A certain concentration of the gaseous substance of the controlled object corresponds to a certain duration of the trigger pulse T2.

One of the main advantages of the device is the transfer of the photodetector to the indicator mode, which eliminates the nonlinearity and instability of its characteristics [24-35].

The use of an optoelectronic device for monitoring the concentration of gaseous substances, the pulse mode of operation of emitting diodes and gating in the processing path of the photoelectric signal increases the signal-to-noise ratio.

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