a device for determining the angle of rotation and incorporate this information into the experiment.

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INVESTIGATION OF THE PARAMETERS OF THE ELECTRIC RESPONSE FROM HEAVY AND LIGHTWEIGHT CONCRETE

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Concrete is the main construction material, which is used in all construction areas. The quality of concrete structures depends on structural composition of concrete, and it is determined by the porosity of the cement stone, the quality of the contact between the cement matrix and the coarse aggregate, the size and composition of the coarse aggregate. Various technological factors in concrete manufacturing may make the concrete structural composition deviate from the design values. Therefore, the structural characteristics of concrete are to be monitored. This may solve the problem of safe operation of concrete structures.

To solve the problem of nondestructive testing of the concrete structural characteristics, we propose to use the phenomenon of mechanoelectrical transformations under elastic impact excitation of heterogeneous non-metallic materials [1–3]. The principle of the phenomenon of mechanoelectrical transformations implies that under elastic impact excitation, the acoustic waves are formed in the sample. The acoustic waves affect the sources of mechanoelectrical transformations, and as a result, alternating electric field arises. The electric field arises due to the charges occurring at the boundaries of piezoelectric quartz (the component of river sand and gravel) under its deformation and due to the shift of these charges and the charges of the electrical double layers (at the boundaries of the components in a heterogeneous material). The electric receiver is located near the sample surface, and it records the change in the summary electric field in the region of its location. Therefore, the parameters of the electric response should reliably trace the processes of transformation of the acoustic

wave characteristics when they interact with the structural inhomogeneities of the heterogeneous material.

The goal of the research was to investigate the parameters of the electric response from heavy and lightweight concrete.

For the experiments, the samples of concrete with a size of 100 × 100 × 100 mm with different coarse aggregate (gravel and keramzit) were made. Gravel is the coarse aggregate of heavy concrete. Keramzit is the coarse aggregate of lightweight concrete.

The experimental research was carried out with the laboratory hardware–software complex to produce pulsed mechanical excitation of samples and record the electric responses. Pulsed mechanical excitation was applied to the sample by means of an electromechanical impact device with a constant impact force. The electrical response to the elastic impact excitation of the samples was detected with a differential electrical sensor. An electrical measuring detector was placed at a distance of 2 mm from the sample surface. A compensating detector identical to the measuring one was placed 30 mm higher than the latter. The measuring detector received both the signal from the sample and a noise signal as a useful signal. The compensating detector was located far from the source of the useful signal and detected only noise. This type of the measuring scheme greatly increases a signal-to-noise ratio. Signals from the electrical sensor were detected with multifunctional I/O board interfaced with a PC to digitize the electric signal time realizations.

Figure 1 (a, b) shows the electric responses recorded under impact excitation of the samples.

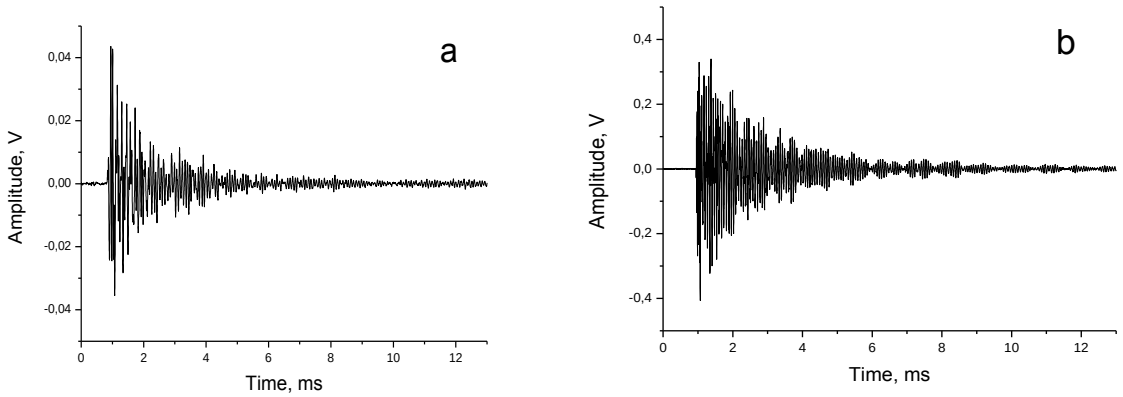

Fig.1. Electric responses under impact excitation: a is for lightweight concrete; b is for heavy concrete.

Figures 1a and 1b indicate that the responses from the samples have a different signal value and are of different attenuation character. The attenuation of the signal is determined by the conditions of the acoustic wave

passage through the heterogeneous material and depends on the ratio of the acoustic wave resistances of the cement matrix and coarse aggregate.

The attenuation coefficients of heavy and lightweight concrete were calculated with a special program in LabView. The attenuation coefficient in lightweight concrete is 919.5 s^{-1}, and in heavy concrete it is 696.3 s^{-1}. Since the acoustic wave resistances in gravel and keramzit are significantly different, the character of signal attenuation in these materials is different [4].

The conducted investigations show that the parameters of the electric response depend on the composition of the coarse aggregate in concrete and can be used for its testing.

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MODELLING OF PV – MODULE BASED ON DATA SHEET PARAMETERS

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Abstract – The PV module is the interface, which converts light into electricity. Modelling of this device requires weather data (irradiance and temperature) as input variables. The output can be current, voltage, power.