References

1. White, N.M., Glynne-Jones, P. and Beeby, S.P. (2001) A novel thick-film piezoelectric micro-generator. Smart Materials and Structures, 10, (4), 850- 852.

2. Abbasi, Aqsa. "Application of Piezoelectric Materials and Piezoelectric Network for Smart Roads." International Journal of Electrical and Computer Engineering (IJECE) Vol.3, No.6 (2013), pp. 857-862.

3. Holler, F. James; Skoog, Douglas A; Crouch, Stanley R (2007). "Chapter 1". Principles of Instrumental Analysis (6th ed.). Cengage Learning. p. 9. ISBN 978-0-495-01201-6.

4. Manbachi, A. and Cobbold R.S.C. (2011). "Development and Application of Piezoelectric Materials for Ultrasound Generation and Detection". Ultrasound 19 (4): 187–196.

THE APPLICATION OF OSCILLATING SYSTEM TO RESEARCH OF PROCESS OF RED BLOOD CELL AGGREGATION IN MICROSCOPIC VOLUME SYSTEMS

Nefedova N.S.
Tomsk Polytechnic University, Russia, Tomsk
Scientific Supervisor: Aristov A.A. associate professor, Ph.D.

Scientists have always been interested in rheological properties of blood. This interest stems from the fact that a large number of diseases caused due to changes in the composition and biophysical properties. Red blood cells consist 98% of the total volume of formed elements of blood and determine the rheological parameters of blood. Hemorheological disorders are of great importance in the pathogenesis of many diseases. Aggregation of red blood cells is the ability of RBCs to form "coin bars", the shape of which depends on the normal or pathological conditions [1]. The nature and process indicators aggregation of erythrocytes can be concluded about the health of the patient.

Photometric methods are used most often to study the process of aggregation. Photometric registration method based on measuring the intensity of the light flux, which receivelets blood in the process of growth units, after the termination of stirring of the test specimen in special cells [2]. A large blood volume, e.g. 1 ml or more are used in modern aggregometers. The task of developing devices with the use of small volumes of blood is relevant at the moment. Therefore, one of the objectives when designing the device for the study of the aggregation with the use of

drip samples was creating a vibration mechanism integrated into this measurement system. Requirements for vibrating the platform:

- Minimum dimensions;
- To ensure the safety of the drops; (no spreading, in the process of vibration)
- Frequency and power fluctuations of the cuvette with the sample is sufficient to break the aggregates.

To create a system of shear deformations, it was decided to use a block electromagnetic focusing used in optical recording devices (CD-ROM, DVD-ROM). The dimensions of this device are allowed to put it in the camera the primary Converter for photometric studies. Instead of the focusing lens was installed in the cuvette for placement of drip samples. Photo presented in figure 1.

Fig.1. Laboratory model system shear deformation

In summing up the AC voltage to the windings of the electromagnets, the possible oscillations of thecuvette with the sample in horizontal and vertical planes. Further experiments showed that the most effective in the breakdown of cellular components and preservation are the drops in the horizontal displacement of the coal region. The changes of amplitude and frequency fluctuations of the cell are carried out by changing the amplitude and frequency of the supply voltage. After the preparation of samples for research and posting it on this cell system is placed in a photometric device, power is supplied to the mechanism that destroys the formed aggregates, the resulting homogeneous suspension is illuminated in parallel and the resulting signal is recorded on a PC.

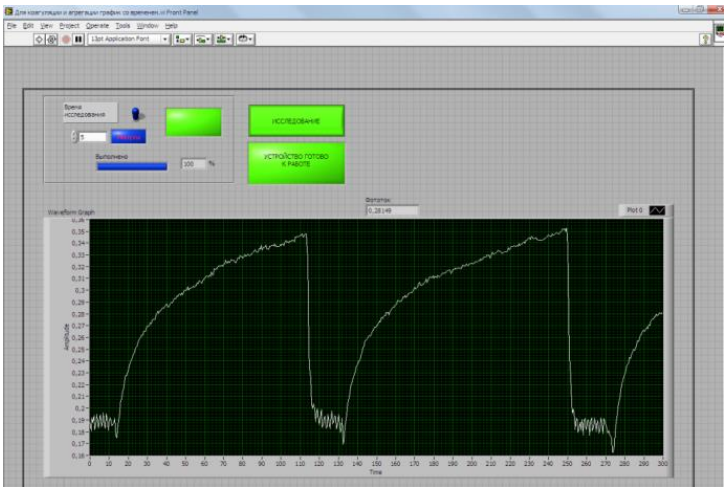

Fig.2. The example of the program

For plant control, visualization and recording of data obtained by transmission of the blood sample, using a program developed in LabView. The window of this program shown in figure 2.

Presented in figure 2 photometric curve, reflects the processes of formation and breakdown of aggregates in the drip sample.

The initial moment of time (10s) this graph reflects the breaking process of the cell units when a voltage is applied to the vibration system. A further increase in light transmission (amplitude) due to the formation of aggregates. Upon reaching the amplitude 0,35 again included In the mechanism breaking and the amplitude was also decreased to values in the 0.19 V, this proves that this system of shear deformation breaks the aggregates and the sample is homogeneous. The parameters were selected, which achieved the maximum breakdown of units (minimum light transmittance) and the shape of raindrops:

- Supply voltage (SP) – 2V,
- The supply frequency (f) is 80Hz.

Research using the proposed device, provided with a vibrational system, ensure reproducibility and high sensitivity of the measuring system to the process of aggregation of erythrocytes

Studies have shown that the proposed system shears trains, consistent with the basic stated requirements and can be used in the system of evaluation of aggregation of red blood cells. Thus, this oscillation system can be used when creating a photometric instrument for studies of aggregation of erythrocytes in microvolumes. In the future we plan to refine the design of the device in terms of ease of its practical application and to conduct its clinical trials.

References

1. Voeikov V. L. Physico-chemical and physiological aspects of the reaction of the blood sedimentation / V. L. Voeykov // USP. Physiology. Sciences., 1998. – Vol. 29, No. 4.

2. Popova E. V., Aristov A. A. a Device for estimating parameters of aggregation of erythrocytes // XIV international scientific-practical conference "Modern technique and technologies" . – Tomsk, 2008. – vol. 1. – S. 226-228.

3. The method of determining the dynamics of sedimentation of blood cells: Pat. 2379687 Russian Federation: IPC G01N33/49, Publ.20.01.2010

4. A device for evaluating the physical properties of biological fluids: Pat. 47526 Russian Federation: IPC G01N33/49, Publ. 27.08.05

FRICTION WELDING

Nikiforov D.S., Raspaev A.A.
Tomsk Polytechnic University, Tomsk
Scientific supervisor M.V. Kuimova, PhD in Methods of TFL,
Associate Professor of TPU

Welding is a technological process of making permanent joints [1]. Friction welding refers to welding pressure. The welded joint is formed in the plastic state under the influence of heat due to the friction of surfaces of the welded parts. The simplest and most common scheme of this process is shown in Image 1. The two parts to be welded are placed coaxially in the force clamps of the machine. One of them is stationary and another rotates around their common axis. The pressure is put on one part and causes the frictional forces. The work done against the forces of friction is converted into heat which heats the adjacent thin metal layers to the temperatures needed for a welded joint. During the friction, the ductile metal is squeezed out in radial directions caused by the axial and tangential forces. The upset metal (weld flash) has the form of a double ring located on both sides of the interference surface (Image 2) [2].