

Project name: Decision tool for optimal design of smart polymer nanocomposite structures produced by 3D printing

Project contract number: 1.1.1.1/19/A/031

PROJECT IMPLEMENTATION FOR THE REPORTING PERIOD
from 01.06.2022 until 31.08.2022.

Company ZRF RITEC SIA

During the reporting period, the following actions were implemented:

1. Another series of resistance measurements of 3D printed samples in a temperature chamber in a wide range of temperatures has been completed. Samples from the following electro conductive polymer materials were used (12 samples from each material, 60 samples in total):

- MULTI3D Electrifi;
- BlackMagic 3D Conductive Graphene;
- ALFAOHM;
- Protopasta Conductive PLA;
- Koltron G1.

The measurement results were entered into tables and the specific resistance values were calculated from them. The dependences of the specific resistances on the temperature of the materials were represented graphically.

2. Special software has been developed that allows capturing volt-ampere characteristic curves for 3D printed samples. This software automatically monitors the readings of power supplies and digital multimeters and performs the following functions:

- Apply voltage to the sample from the power supply unit for a certain period of time;
- With the help of a digital multimeter, read the current value in the sample;
- Disconnects the voltage from the sample and saves the measurement results to a file.

3. Volt-amperes characteristics have been taken for 3D printed samples of the above mentioned electro conductive polymer materials. 2 samples of each material were used for the measurements.

Recording of the volt-ampere characteristic curves took place under the following conditions:

- In the temperature chamber, at a constant temperature of +25°C;
- The voltage values were varied from 5 to 120 volts;
- The voltage was applied for 2 seconds. This was necessary to prevent overheating of the samples;
- When a voltage is applied to the sample, it heats up and its resistance changes. Therefore, before applying a new voltage value, it is necessary to make sure that the sample has cooled down enough after the previous measurement and that its resistance value has stabilized.

4. 3D printed samples were made of a new electro conducting polymer material – AMOLEN.

Resistance of these samples is currently being measured in the temperature chamber in a wide temperature range. Preparation of samples from this material is carried out by order of the LU.

5. A study on the effect of post-treatment on the properties of the 3D printed samples has been initiated. The work uses samples from a non-conductive filament.

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