

Thermoplastic sorptive materials fabricated using 3D printing techniques: design and assessment in biomedical and pharmaceutical analysis.

Various 3D printing techniques are gaining importance in many fields of science and beyond. One of the most widely used techniques is called fused deposition modeling (FDM), which is based on shaping the material (thermoplastic filament) by pressing it through the heated nozzle. The nozzle controls the flow of material and creates (layer by layer) a three-dimensional object, through a computer-controlled, programmed sequence of nozzle movements. The project team is implementing a study involving the use of FDM printed components as chemically active sorbents that enable the extraction of small-molecule analytes from biological matrices. The results gathered so far with the use of LAYFOMM material confirm that there is a large, previously unexplored potential in this technique. One of the most important advantages of the 3D printing technique is its wide availability, low cost and the ability to transfer the production of the sorbent (with easy customization suited to current analytical application) to the scientific lab.

The goal of the project is to use two features of the 3D printing technique:

- the possibility to design objects (sorbents) of any 3D shape,
- the ability to print from materials with specific/planned physical and chemical properties.

Such an innovative approach may lead to the introduction of a new way of producing analytical systems. The project assumes testing new shapes of active elements and their inactive surroundings, with particular emphasis on the solutions originated in nature – biomimetic approach. On the other hand, the project will develop new thermoplastic materials with planned activity for analytes with different properties. An attempt to use chemical compounds known as environment friendly will also be undertaken. As a result, the project should provide innovative, inexpensive and flexible analytical tools that can be used in many areas of life, especially in medicine.