One of the latest and very precise techniques of creating tools and structures is the 3D printing. Depending on the need and scale, the printing process uses different techniques of depositing subsequent layers of a material, finally achieving a ready product. In the end the finished products are printed directly from the digital model and have very good dimensional tolerances.

It entails both scientific and industrial environments, to use this technique in their work. The elements obtained by 3D printing technology may be modified according to their planned applications, for example by deposition by metallic coatings.

The idea realized in the present project is a combination of 3D printing technology with processes of metal and alloy coating. As a result of research work, it is planned to obtain composite elements of small dimensions (up to 5 mm) with the possibility of transport them using magnetic field.

An innovate approach in the presented project is the combination of 3D printing technology and the using of electrochemical processes of the synthesis of magnetic mobile composite elements. Coupling of these two solutions gives the opportunity to precise control both the shape of microrobots, directly printed from digital model, and the magnetic properties as an effect of the composition and thickness of the deposited coatings on plastic surface.

The coatings are planned to fabricate in two ways. The first one is one-step electroless deposition of ferromagnetic metals (cobalt, nickel). The other idea is a two-step process consists of electroless deposition of non-magnetic coating (e.g. copper), which provides conductive properties, and electrodeposition of coatings with magnetic properties. The final step of experimental work will be analysis of trajectory of synthesized microelements under magnetic field activity.

Requirements of the manufacturing of these composites are high dimensional accuracy of printed elements, thin, compact and smooth coatings, corrosion resistance of them and anisotropy of magnetic properties giving a possibility of controlled moving in the liquid medium. These properties can be obtained by controlling production parameters such as electrolyte composition, quality of metallized components surface, temperature, process time etc. Anisotropy of magnetic properties is planned to obtain by using magnetic field during the synthesis of metallic coatings. Namely, scientific papers report that the application of magnetic field of a certain orientation and intensity influences on microstructure of the obtained coatings.

As a result of the intended purpose, it is planned to obtain lightweight, chemically resistant components. Their important feature is the possibility of non-contact control of their movement.

The elements produced in this way can be widely used in fields where controlled transport is required. For example, it may be a targeted therapy based on the precise delivery of a drug to a particular body tissue, the transport of micro-sensors, or other specific substances. There are a number of literature reports focusing on this issue, which clearly indicates high interest in this research subject.