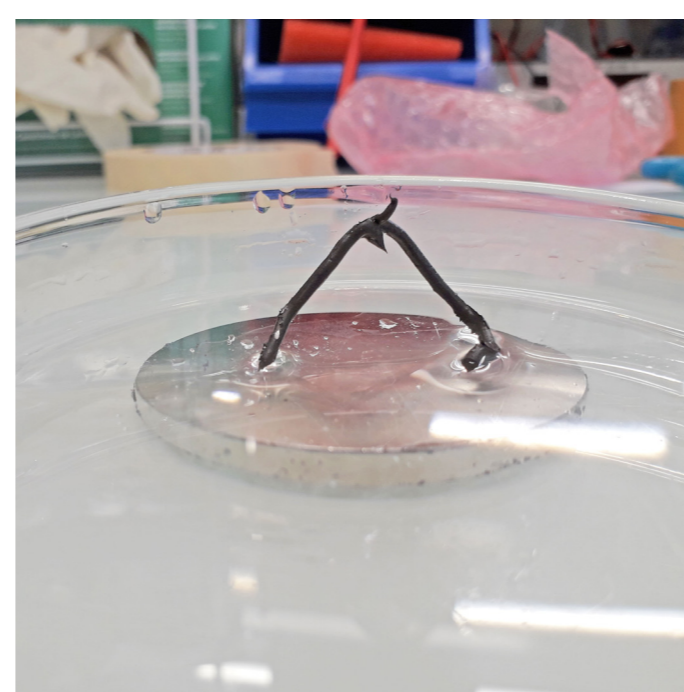
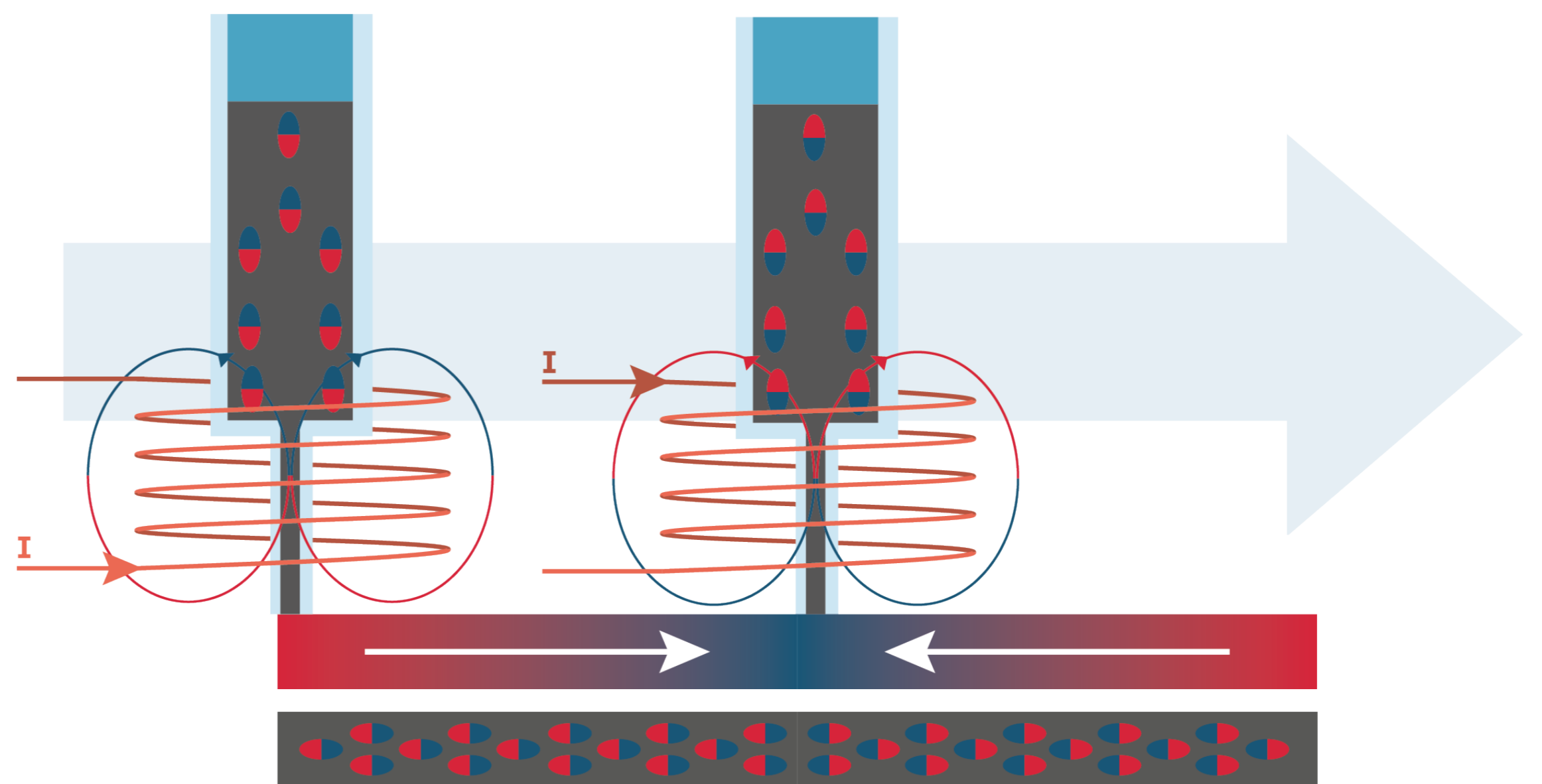
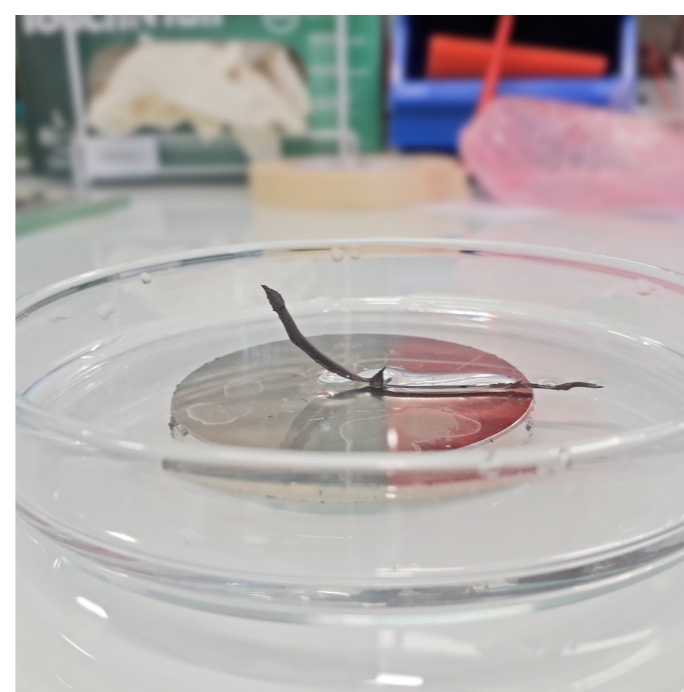


Magnetic Soft Materials

Magnetic soft materials are a recently developed material that transforms its shape when it is placed in a magnetic field. This graduation project marks the start of the research into magnetic soft materials at the faculty of Industrial Design Engineering.



Magnetic soft materials consist of silicone with incorporated magnetic particles. The particles lay in magnetization patterns due to being printed under a magnetic field that rotates them, creating local North and South poles (see the figure above). During the shape transformation, the magnetic fields of these particles align with the external magnetic field, pulling the silicone in the programmed shape.



In one part of this project, the development of the ink recipe of silicones and magnetic particles, and a 3D printer with an electromagnet attached to the nozzle was started. This resulted in a proof of principle that can move and transform its shape in a magnetic field (see the figures at the left). This demonstrates the feasibility of fabricating magnetic soft materials at the faculty

Magnetic soft materials have fast, remote, reversible and heatless shape transformations. A concept for a demonstrator was developed that incorporated these characteristics to explain the material to designers and researchers and inspire them. The demonstrator is a cleaning tool that can be reshaped by moving a magnet. It can reach hard to enter spaces by using the elasticity of the silicone to roll up the tool.



In literature, magnetic soft materials are often discussed for their potential in the biomedical field, like target drug delivery. However, not many other domains have been explored yet. The other result of the design process is six new domains that have been added to the solution space in which magnetic soft materials can be used: haptics, personalized fits, texture change, replacement of vulnerable mechanical parts, milli devices and scaffolding, and toys.



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Integrated Product Design

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