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Development of a Shape Memory Polymer Soft Microgripper

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ABSTRACT

The ability to control microrobots by means of magnetic fields has become of increasing interest to researchers. These robots' ability to reach places tethered microrobots otherwise could not leads to many possible applications in the body, such as delivering drugs to targeted locations and performing biopsies. This study shows the use of shape memory polymer (SMP) to wirelessly actuate a microgripper to be used by a controllable microrobot to achieve these functions. Many smart materials were analyzed in order to find the material that most effectively would accomplish wirelessly gripping, manipulating, and releasing a microobject. Multiple microgripper designs were designed, analyzed, and constructed at a macroscale from acrylic, simulating a microscale counterpart. Simulated and experimental data were compared to determine the design that would require the least amount of inputted force and displacement from the SMP. This study shows a proposal for scaling this final design to the microscale involving experimentation with different forms of SMP in order to make the gripper actuatable in biologically relevant conditions. This technology could provide an inexpensive and effective solution for manipulating cells and other microobjects *in vitro* and *in vivo.*

KEYWORDS

Microgripper, Microrobotics, Shape Memory Polymer, Shape Memory Alloy, Smart Materials