

On-Demand Orbital Magnetic Actuation of Multiple Polymeric Microbots

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Polymer-based soft robots have recently drawn large attention in biomedical, military, and industrial applications. Magnetically responsive soft robots are capable of wireless and rapid actuation in ambient environments without heating or wet conditions. Herein, we demonstrate parallel magnetic manipulation of multiple soft microbots, consisting of thermoplastic polyurethane-iron oxide nanoparticles composite. Hierarchical magnetomotility - orbital rotation and revolution of the microbots is regulated by a rotation speed of permanent magnets located at the center. The orbital radius, velocity, and pathway can be regulated and the locomotion velocity reached 40 mm/s with only 177 μg of body weight. We will also discuss the orbital maneuverability of the soft microbots in various environments including hills, stairs, and underwater.