Anisotropy in Nanomagnets for Sensors and Actuators in Soft Robotic Applications

Minjeong Ha*

School of Materials Science and Engineering, Gwangju Institute of Science and Technology

*minjeongha@gist.ac.kr

Soft robots are designed to mimic the sensory and motor functions of living organisms, making them effective in handling delicate tasks, navigating narrow spaces, and recognizing environmental conditions. In robotic operation, the selectivity and directionality of sensors and actuators are crucial for precise control. The use of anisotropic nanomagnets represents a promising approach to achieve these functionalities. We have applied several nanometer-thick layers of these nanomagnets to develop giant magnetoresistive sensors that can detect magnetic fields with high selectivity and provide proximity information. Additionally, we have developed flexible and printable magnetic pastes for on-skin electronic compasses. By synchronizing these sensors with actuators, we have developed soft, hingeless magnetic origami actuators that can transform their shape and direction of actuation under the guidance of light and magnetic fields. These highly selective and directional sensing and actuating, based on anisotropic nanomaterials, enable robots to perform complex tasks with precision and complete independence.