

# 이방성 자성소재 제조와 소프트 로봇용 센서-액추에이터 응용

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Soft robots, designed to manipulate objects with dexterity comparable to that of living organisms, are well-suited for delicate tasks, navigating confined spaces, and recognizing environmental conditions. Precise control in robotic operations depends significantly on the selectivity and directionality of sensors and actuators. Magnetic anisotropy offers a promising approach to achieving these critical functionalities. Here, we applied nanometer-thick layers of anisotropic magnets to develop giant magnetoresistive (GMR) sensors with high selectivity in magnetic field detection, enabling proximity sensing. Additionally, we developed flexible and printable magnetic pastes for on-skin electronic compasses. By integrating these sensors with actuators, we fabricated soft, hingeless magnetic origami actuators capable of transforming their shape and direction of actuation under remote control by applying light and magnetic fields. Magnetic nanomaterials, with their anisotropic characteristics, facilitate highly selective and directional sensing and actuation, allowing robots to perform complex tasks with precision and autonomy.

**Keywords:** Soft robots, sensors, actuators, magnetic materials, anisotropy

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