

Self-healing conductive material for structures and electromechanical sensors

Summary/characteristics

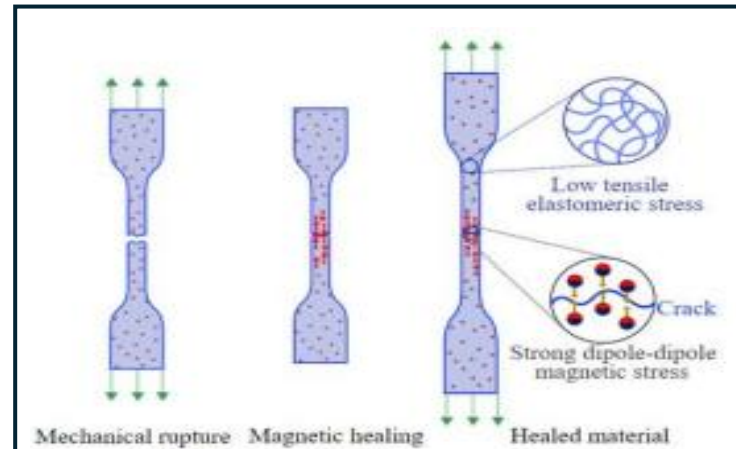
The Universidad Carlos III de Madrid (UC3M) has developed a new optimized material with self-healing capability and electrically conductive properties that vary depending on the magnitude and type of mechanical deformation applied to the component. When the material breaks into two or more parts, interrupting its conductivity, the fracture heals autonomously thanks to the interaction between magnetic particles and the magneto-mechanical balance with the soft elastomeric matrix. Once repaired, it behaves as a continuous, conductive structure under new mechanical loads and can withstand deformations greater than 20% without compromising its structural integrity.

This material is suitable for applications in electromechanical sensors and actuators, self-healing soft material structures, biomedicine, smart textiles, robotics, and soft electronics.

The research team is seeking potential partners and licensees to further develop the technology and bring it closer to market application.

Innovative Aspects

- Autonomous self-healing based on the interaction between magnetic particles and elastomer, without the need for external stimuli.
- High number of repair cycles, overcoming the limitations of current materials.
- Recovery of mechanical functionality: after repair, it withstands deformations greater than 20% while maintaining structural integrity.
- Adjustable electrical conductivity depending on the mechanical deformation applied.
- Fast and sharp response in electrical properties under fracture conditions, reusable thanks to its self-healing capability.



Functioning of the self-healing material

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Competitive Advantages

- Greater durability and service life compared to conventional sensors, as they can be reused after fracture.
- No external energy is required to initiate the repair process, unlike other self-healing materials.
- Multifunctional material combining strength, conductivity and self-healing in a single compound.
- Improved safety and monitoring in sectors such as medical rehabilitation or wearables.

Technology readiness level

In development pHase – Tests in controlled environments completed. TRL 4.

Intellectual and Industrial Property Status

Spanish patent granted P202230621. Title "Self-healing conductive material."

Type of collaboration sought:

Collaboration agreements, investment agreements and/or licence agreements are sought to cooperate with industrial partners and research centres working in electromechanical sensors, soft robotics, rehabilitation and physiotherapy.