

IIT Bhilai Researchers achieve Breakthrough in Self-Healing Polymer Technology for Safer, Smarter EVs, Aircraft, and Protective Gears

A research team at IIT Bhilai, comprising Swarup Maity, Priyank Sinha, Koushik Mahata, and Dr. Sanjib Banerjee, has developed a groundbreaking impact-resistant self-healing polymer that has the potential to transform multiple industries, including electric vehicles (EVs), aerospace, and personal protective equipment (PPE). The polymer behaves like a smart shield; it remains tough during regular use, but when exposed to sudden shocks, it softens slightly to absorb the impact, preventing cracks and fractures. If a scratch or cut is generated, the material autonomously repairs itself, restoring its original strength. The polymer is made using a low-cost, scalable process and is heat-resistant, sticks strongly to surfaces, and can be reused many times without losing its properties, making it suitable for industry use.

The benefits of this innovation extend across critical sectors. In electric vehicles, the polymer can enhance battery safety and crash resilience by reducing the risk of thermal runaway. In aerospace, it can enable in-flight healing of minor damage, reducing inspection frequency and downtime. For protective gear, the material promises next-generation impact resistance and durability for military, law enforcement, and sports applications.

By extending the lifespan of products and reducing the need for frequent replacements, the self-healing polymer not only improves safety and reliability but also contributes to sustainability by minimizing waste and lowering carbon emissions. This pioneering research highlights IIT Bhilai's commitment to developing advanced technologies that combine durability, safety, and environmental responsibility.

This landmark work has been published in the world-renowned journal *Advanced Functional Materials* (Wiley-VCH), solidifying its impact on the future of polymer chemistry.

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