# Self Healing Electronic

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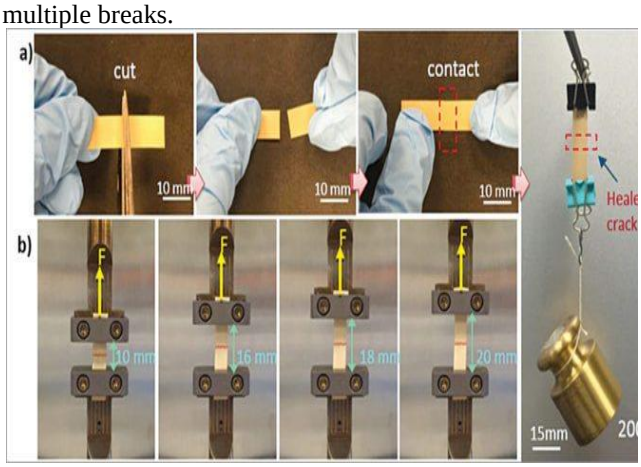
***Abstract*- Studies about the information in technical research paper will present the information related to SELF HEALING ELECTRONICS Technology. The self healing materials are a class of smart materials that have structurally absorb ability to repair the damage caused by mechanical usage over time. As sometimes we cannot get to the inside of such a device. for ex, in a multi-layered integrated circuit(MIC), there is no way to open it up,normally, you would just replace the whole chip. The inspiration comes from biological systems, which have ability to heal after being wounded. researchers have developed a flexibleelectronics material that self-heals to restore many functions. the healed materials are still able to stretch and hold weight**.

## INTRODUCTION

A researcher has developed a flexible electronic material that self-heals to restore many functions, even after multiple breaks.




An international team of materials scientists and engineers has created a self-healing material that restore all electronic method even after multiple breaks. This could greatly improve the durability of wearable electronics. Even when cut completely in half, the material remains capable to complete repair without external influence.

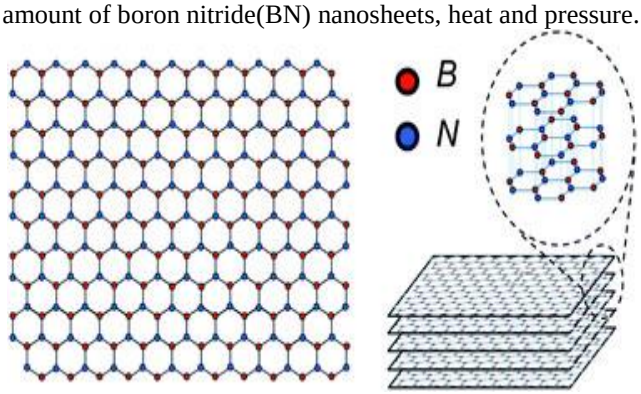
now restoring all electrical functions. a material is broken has not been possible. In order to create effective wearable electronics that are self-healing, the researchers absorb a dielectric, or insulating factor, into the wearable electronics to protect the material. After breaking, it is critical to maintain electrical resistivity and thermal conductivity to show electronics from overheating.

The researchers successfully created a material capable of restoring the functions in electronics after a break:

- Mechanical strength
- Breakdown strength
- Electrical resistivity
- Thermal conductivity
- Insulating properties

*A. Impermeable Nanosheets:*

The insulating material of choice is a two-dimensional boron nitride (BN) nanosheet. The nanosheets are added to plastic polymer base. By means of hydrogen bonding on the surface of thatsheets. the naturally occurring electrostatic attraction draws the broken pieces close together. the hydrogen bond is restored, and the material is healed. Factors affecting the healing capabilities are the amount of boron nitride(BN) nanosheets, heat and pressure.




*Boron nitride nanosheet. (Image courtesy of Nanoscale.)*

Most research into self-healable electronic materials has focused on electrical conductivity, but dielectrics have been overlooked, material science and engineering at Penn State. “We need conducting elements in the circuits, but we also need protection andinsulation for microelectronics.”

Harder the other healable materials the boron nitride nanosheets are also impermeable to moisture. Therefore, the dielectric material is more versatile than comparable materials, and the wearer will not have to worry about removing the device when exposed to different levels of moisture, or even submerging it in water.

“This is the first time that a self-healing material has been created that can restore multiple properties over multiple break, and we see this being useful across many applications’’ The material is able to self-heal because boron nitride(BN) nanosheets connect to one another with hydrogen bonding groups functionalized onto their surface. When two pieces are placed in close closeness, the electrostatic attraction naturally occurring between both bonding elements draws them close together. When the hydrogen bond is restored, the two pieces are "healed." Depending on the percentage of boron nitride(BN) nanosheets added to the polymer, this self-healing may require additional heat or pressure, but some forms of the new material can self-heal at room temperature when placed next the each other.

healable materials that use hydrogen bonds, boron nitride(BN) nanosheets are impermeable to moisture. This means that devices using that dielectric material can operate effectively within high humidity contexts such as in a shower or at a beach.

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B. *Electronics requirements from self-healing materials*

Self-healable materials are those that, after withstanding physical deformation such as being cut in half, naturally repair themselves with short to no external influence. The new electronic material created, can heal all its functions automatically even after breaking multiple times. This material could improve the durability of not only for wearable electronics but all other electronic devices.

In the past, researchers have been able to create self-healable materials that can restore one function afterbreaking but restoring a set of functions is critical for creating effective wearable electronics. For ex, if a dielectric material retains its electrical resistivity after self-healing and not its thermal conductivity, it could put electronics at the risk of over-heating. This is the first time that a self-healable material has been created that can restore multiple properties over multiple breaks this could be useful in many applications

*C. Electronic conductivity*

There has been a good research push aimed at developing self-repairing, electrically-conductive materials that can withstand the damage caused by the twisting and deformation of materials. But so far, many of research has focused on self-repairing electrical conductors. The team previously developed a system for self-healing polymer materials and decided to adapt their technique for the conductive systems. It dispersed tiny microcapsules, as small as ten microns in a diameter, on top of a gold line functioning as a circuit. As a crack propagated, microcapsule broke open and released the liquid metal contained inside. The liquid metal filled the gap in the circuit, restoring electrical flows.

This is one ex. of taking the microcapsule based healing approach and applying to the new function. Everything previous to this has been on structural repair. This is on conductivity restoration. It shows that the concept translates theother things as well. A failure interrupts the current for mere microseconds as liquid metal immediately fills the crack materials.

The researchers demonstrated that 90% their samples healed to 99 % of original conductivity, even with a small amount of microcapsules. The self-healing system also has anadvantage of being localised and autonomous. The Only microcapsules that a crack intercepts are opened, so repair only takes place at the point of damage. Further, it requires no human intervention or diagnostics—a good thing for applications where accessing a break for repair is impossible, such as a battery, or finding the source of a failure is difficult, like as an aircraft or a spacecraft.An international team of materials scientists and engineers has created a self-healing material that restore all electronic method even after multiple breaks. This could greatly improve the durability of wearable electronics. Even when cut completely in half, the material remains capable to complete repair without external influence.Most research into self-healable electronic materials has focused on electrical conductivity, but dielectrics have been overlooked, material science and engineering at Penn State. “We need conducting elements in the circuits, but we also need protection and insulation for microelectronics.”

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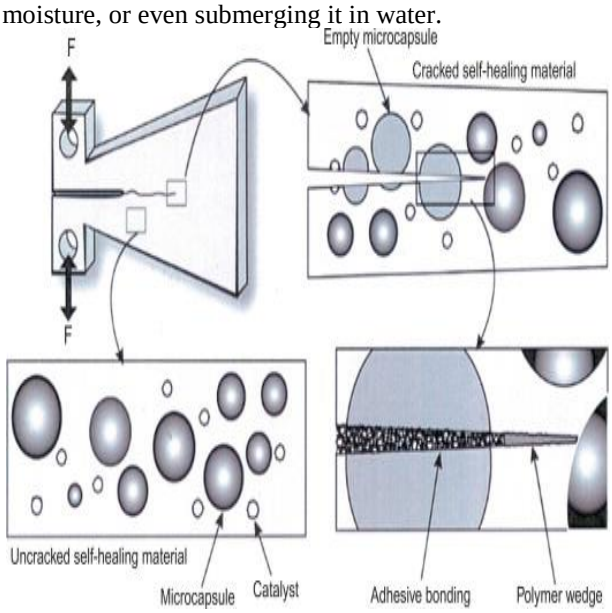


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## D. CONCLUSION

In conclusion, we have briefly presented a series of recent results related to the most self-healing concepts and systems. Research into self-healing materials is anexciting andactive field, with an increasing number of research papers being published every year. From the studies on healing in concrete structures via embedded glass fibres to the more recent work on healing using shape memory alloy wires in a polymer composite, and the use of multidimensional microvascular network for the healing applications, the different avenues being explored to achieve the common end goal of prolonged functional lifetimes for composite structural materials are amazing.

Beyond a strong interest of both commercialand academicresearchers in the hollow fibre and microencapsulation approaches to self-healing polymer development, new types of self-healing technology have been emerging at an increasing rate over the last decade. Indeed, in recent years, interesting perspectives have opened for the design of innovative self-healing Nano systems. Computer simulations have provided useful indications for directing the efforts of scientists toward the fabrication of self-healing systems.

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