Scientists develop novel self-healing human-machine interactive hydrogel touch pad

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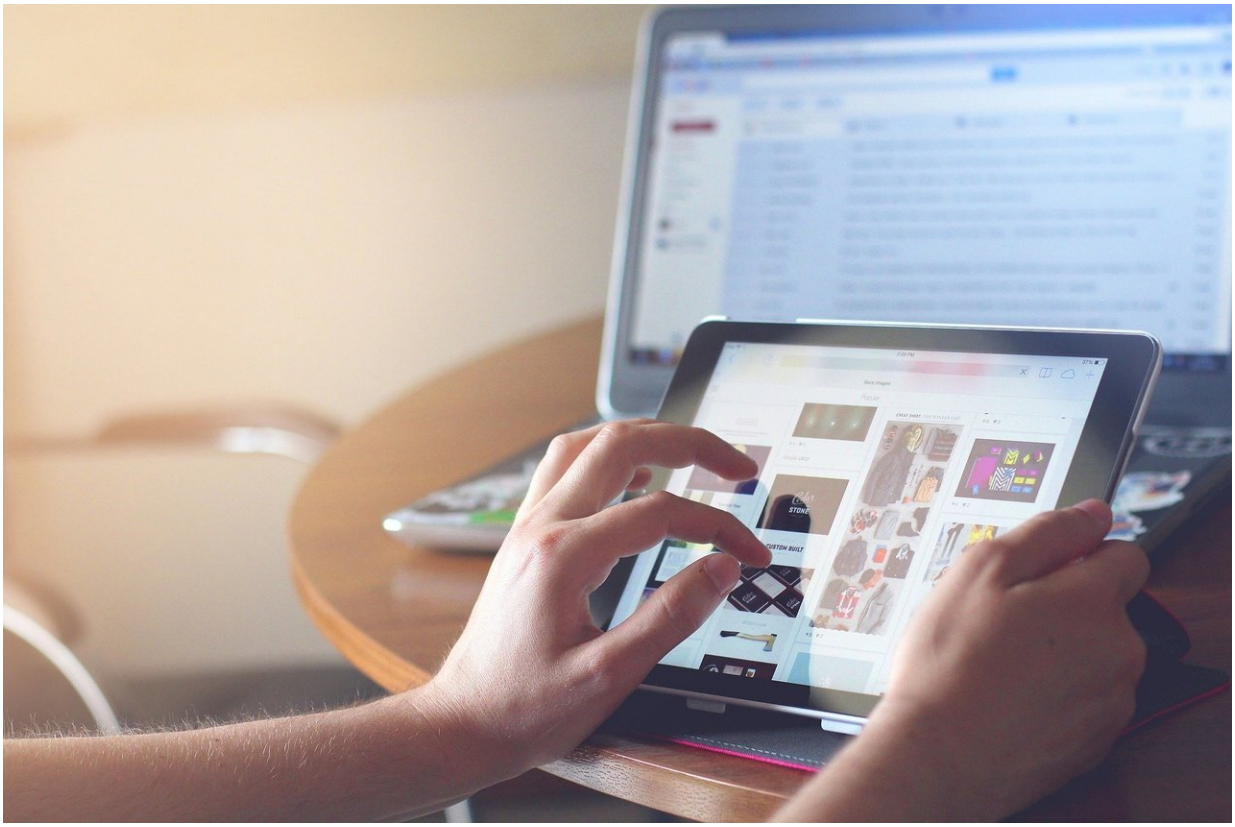

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A research group led by Prof. Chen Tao at the Ningbo Institute of Materials Technology and Engineering (NIMTE) of the Chinese Academy of Sciences (CAS), developed a novel soft self-healing and

adhesive human-machine interactive touch pad based on transparent nanocomposite hydrogels, in cooperation with the researchers from the Beijing Institute of Nanoenergy and Nanosystems of CAS. The study was published in *Advanced Materials*.

With the rapid development of information technology and the Internet of things, flexible and wearable electronic devices have attracted increasing attention. A touch pad is a requisite input device for a mobile phone, smart appliance and point-of-information terminal. Indium tin oxide (ITO) has been used as the dominant transparent conductive film for manufacturing commercial touch pads, which inevitably have obvious shortcomings, like fragility.

To improve the stretchability and biocompatibility of touch pads to allow their interaction with humans, the researchers at NIMTE developed highly transparent and stretchable polyzwitterion-clay nanocomposite hydrogels with transmittance of 98.8% and fracture strain beyond 1500%.

By virtue of the synthesized hydrogel as a transparent ionic conductor, they prepared self-healing human-machine interactive touch pads, which are pressure-sensitive adhesive to various curved or flat insulating substrates, including glass, wood, cotton fabric, poly(ethylene terephthalate) (PET), acrylonitrile butadiene styrene (ABS), silicone rubber, nylon, and poly(methylmethacrylate) (PMMA), through attach and gentle press, thus satisfying the requirement for the integration into electronic devices and wearable applications.

A surface-capacitive touch (SCT) system was then adopted for the hydrogel touch pad, in which the same voltage was applied to all corners of the pad thus resulting in a uniform electrostatic field across the pad. Therefore, finger position could be perceived through measuring the current value in four corners of the hydrogel, during both point-by-point

touch and continuous moving.

Furthermore, hydrogel touch pads were integrated into computers for drawing, writing, and playing electronic games and showed high-resolution and self-healing input functions. The direct current in a cut-then-joint hydrogel recovered in 21 s. Besides, the tensile properties and finger location function of cut-then-joined hydrogels gradually recovered.

The study may shed light on the utilization of polymeric nanocomposite hydrogels as flexible human-machine communication interfaces with the self-healing nature.

More information: Guorong Gao et al. Bioinspired Self-Healing Human–Machine Interactive Touch Pad with Pressure-Sensitive Adhesiveness on Targeted Substrates, *Advanced Materials* (2020). DOI: 10.1002/adma.202004290

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