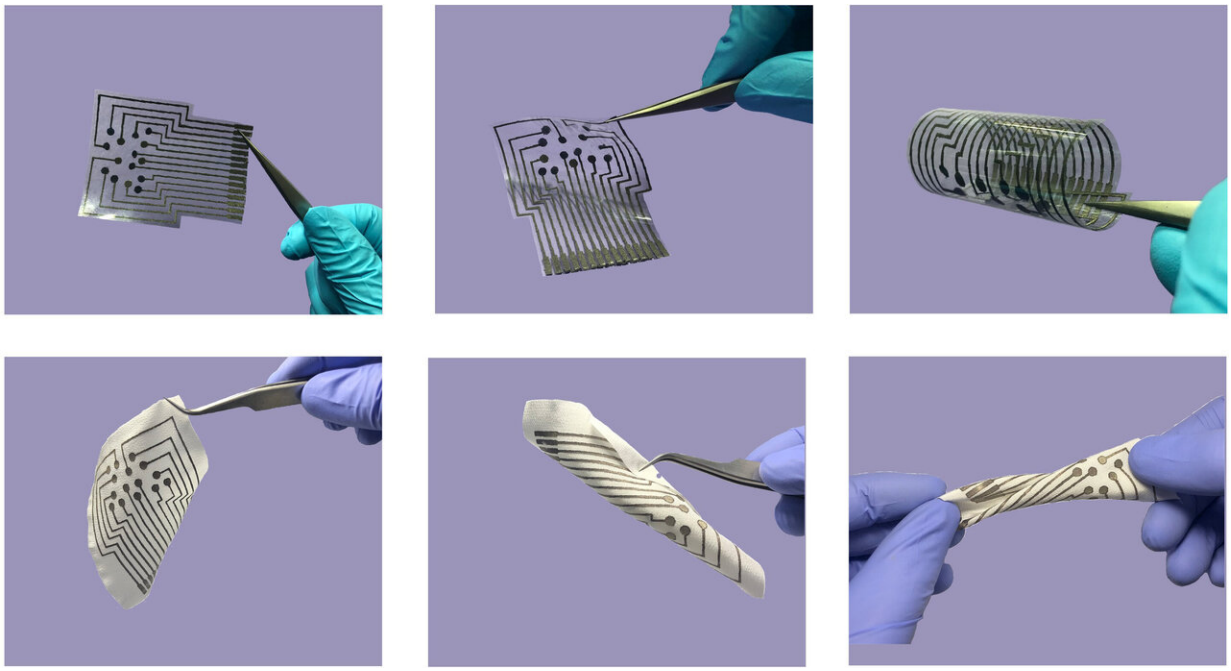
A patch that simultaneously measures six health-related biomarkers by analyzing sweat

November 11 2019, by Bob Yirka



Sensor array on different flexible substrates. Credit: Tsinghua University

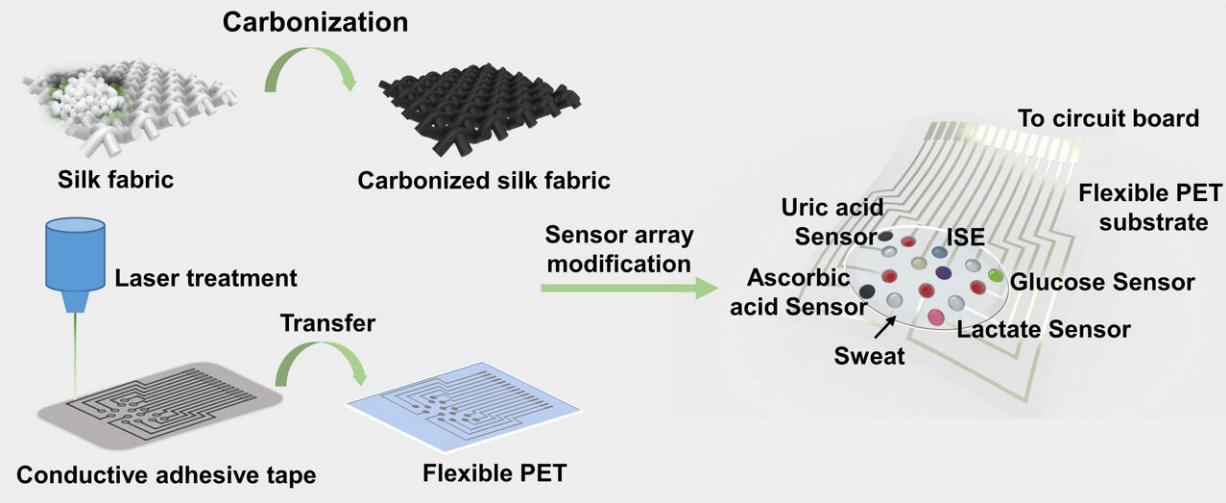
A team of researchers from Tsinghua University and Northwest University, both in China, has developed a patch that can be used to measure six health-related biomarkers by analyzing sweat. In their paper published in the journal *Science Advances*, the group describes their patch and how well it worked when tested.

As the researchers note, wearable devices that can measure biometric health-related markers provide benefits over standard techniques used to measure such markers. Not only are they non-invasive, they can also be used in real time. Currently, to learn about health markers such as glucose or uric acid levels in patients, blood must be drawn and sent to a lab where highly skilled people study it and then return results. Because of such issues, many researchers are looking for ways to make the process less invasive and closer to real time. In this new effort, the researchers in China claim to have created a patch that solves both issues.

The new patch was made by embedding sensors in a woven graphite-silk fabric. Conductivity was enhanced using graphite doped with nitrogen atoms. The resulting electrochemical patch could then be applied to the skin on the arm and used to collect data from sweat for glucose, ascorbic acid, lactate, potassium, sodium ions and uric acid levels. They report that the patch was also flexible, which allowed it to conform to the skin.

The researchers note that sensors for studying sweat include devices that measure color range using fluorescence methods or electrochemical processes—though the latter are the preferred method. The sensors they employed could measure acids by monitoring the amount of current that arises during oxidation. And materials such as lactate and glucose could be measured by studying the amount of hydrogen peroxide created during the enzymatic redox process. And finally, potassium and sodium ions were measured using sensors with ion-selective membranes.

Real-time sweat analysis on human body. Credit: Tsinghua University



Schematic illustration of fabrication process of the sensor patch. Credit: Tsinghua University

The researchers tested their patch by applying it to the arms of five healthy young adult volunteers who pedaled on an exercise bike. Results were sent to a smartphone. They report that the patch was able to provide simultaneous measurements of all six biomarkers with a high degree of sensitivity throughout a workout session.

More information: Wenya He et al. Integrated textile sensor patch for real-time and multiplex sweat analysis, *Science Advances* (2019). DOI: 10.1126/sciadv.aax0649