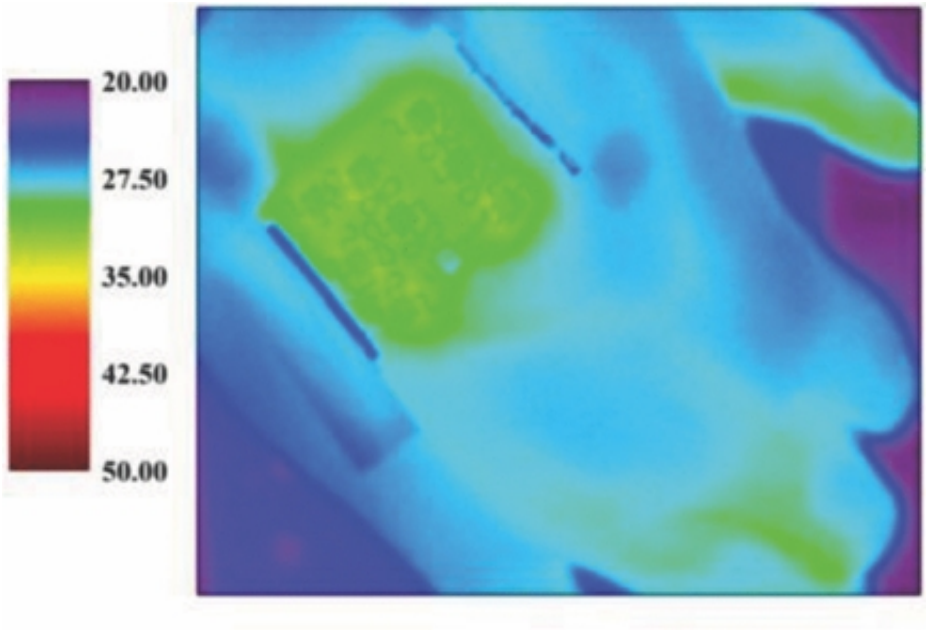
Team develops thermotherapy smartphone controlled skin patch for pain relief

December 16 2014, by Bob Yirka



Credit: *Advanced Healthcare Materials*

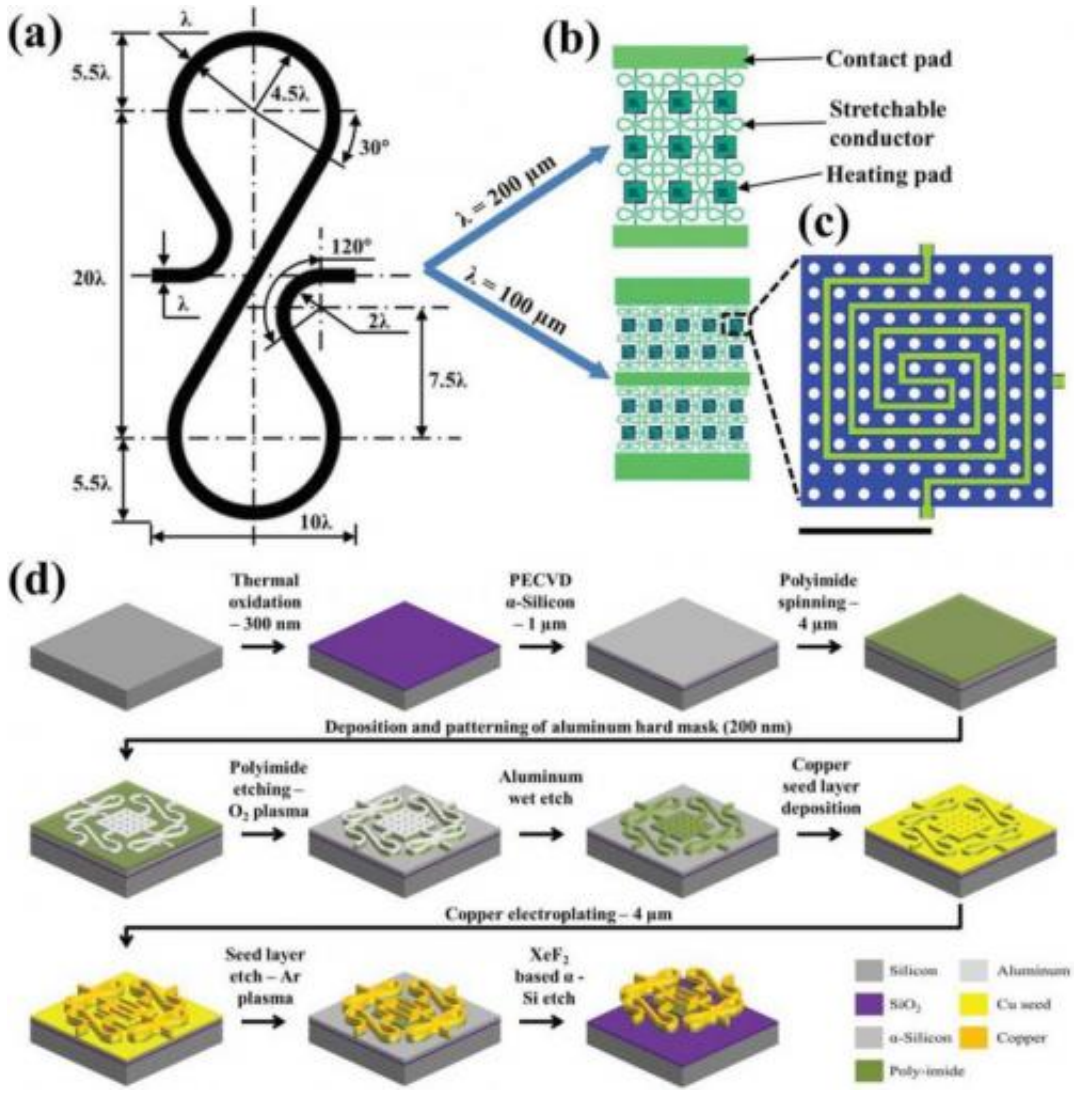
A team of researchers at King Abdullah University of Science and Technology in Saudi Arabia has developed an electronic skin patch that can provide heat for relief of pain. In their paper published in the journal *Advanced Healthcare Materials,* the team describes the hurdles they overcame in designing and building the patch and where they hope to take it in the future.

Millions of people the world over use thermotherapy skin patches for

pain (either due to injury or arthritis)—chemicals in the patches cause warmth to seep into aching muscles or joints, offering relief. But the patches have a major drawback—they're not reusable which means that over time, using them can become very expensive. In this new effort, the researchers have created a patch that can be reused indefinitely.

To make the patch, the team used an electrochemical process to deposit a very thin layer of copper onto a layer of silicon which was grown using a thermal process. The copper was laid down in a grid of semi-spring like shapes—the bending of the metal allows for the patch as a whole to be stretched—a necessary ability for a skin patch. Reactive ion etching was used to cause the silicon/oxide films to be released from the silicon underneath which was in turn transferred to a polymer base. The result was a copper based mesh type patch that is capable of being stretched by 800 percent and is also resistant to oxidation.

The patch also holds circuitry and a standard coin sized battery (which currently lasts just a couple of hours of continuous use) and is able to communicate wirelessly with a smartphone or other device. Users can set the temperature they desire, time span, etc. The team reports that they have built several prototypes and have tested them for pain relief and durability on both machines and human test subjects. They report good results but note that more work needs to be done before they are ready to call their patch a commercial product. They note that their current estimates suggest that once that happens, the patch will likely cost consumers just $4.



Credit: *Advanced Healthcare Materials*, 2014. doi: 10.1002/adhm.201400647/abstract

More information: Ultrastretchable and Flexible Copper Interconnect-Based Smart Patch for Adaptive Thermotherapy, *Advanced Healthcare Materials*, 2014. onlinelibrary.wiley.com/doi/10 … m.201400647/abstract

Abstract

Unprecedented 800% stretchable, non-polymeric, widely used, low-cost, naturally rigid, metallic thin-film copper (Cu)-based flexible and non-invasive, spatially tunable, mobile thermal patch with wireless controllability, adaptability (tunes the amount of heat based on the temperature of the swollen portion), reusability, and affordability due to low-cost complementary metal oxide semiconductor (CMOS) compatible integration.

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