Future LEDs may be what the doctor orders

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Researchers have developed a flexible lighting device that could assist the medical world and see the creation of a new fashion craze - light-emitting tattoos.

In a paper published today in *Nature Materials* (http://www.nature.com/nmat) ,a team at the University of Illinois (http://www.illinois.edu) have outlined their work on a new generation of ultra-thin and extremely flexible light emitting diode (LED) arrays.

Professor John Rogers of the University of Illinois' Department of Materials Science and Engineering, says the LEDs are far smaller than conventional devices and can be attached to many kinds of flexible material.

"That can range from rubber bands to balloons to sheets of paper to threads and tapes and surgical gloves ... they could open up new application opportunities," he says.

In this study, the LED arrays are attached to a plastic film only one or two microns thick, or about one hundredth the thickness of a human hair.

"It's that very thin geometry," says Rogers "that allows us to build thin devices in mesh layouts that can be stretched and twisted and folded and bent and wrapped over curvilinear surfaces that would be impossible to do if you were stuck with a conventional thick bulky layout."

The LEDs can be twisted into a 720-degree helix *(Source: University of Illinois)*

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'Exciting technology'

Distinguished Professor Chennupati Jagadish of the Department of Electronic and Materials Engineering at the Australian National University (http://www.anu.edu.au) in Canberra is enthusiastic.

"It's a very exciting technology," he says. "Whenever you make brittle materials very thin, their properties change significantly, particularly their mechanical properties and these researchers are making use of that feature."

Rogers says that the first step in developing the flexible LEDs was to work out how to make devices at that scale and integrate them into arrays that would give the large deformations they wanted.

"Then we're interested in demonstrating a series of applications that we think are uniquely enabled by those approaches", he says.

Rogers and his team are partly funded by the Ford Motor Company and are investigating automotive uses for the technology; as well as possible military applications.

Medical applications

Perhaps the most important applications will be in medicine. LED arrays could be implanted to activate photosensitive classes of drugs, detect infection and monitor, or even accelerate, wound-healing. Light-emitting sutures are another application being tested in the laboratory.

Jagadish says this is a novel development.

"Applying this to biological applications is certainly very new and very interesting, particularly light emitting sutures," he says. "That's something that will quite significantly enable surgeons to better heart surgery and those types of things."

Rogers says, currently, one of the main drawbacks of the technology is that it needs an external power source.

"All of the demonstrations in this paper use an external battery, so wires come out of the device and you hook it up to a battery and run it that way. For some of the implantable systems like LED tattoos and photonic sutures and so on, you might like to have onboard power."

Jagadish says this is a normal part of the development pathway.

"Whenever we're developing new technologies, demonstrating the ideas is the first step and then smart engineering comes into the picture and people will develop the technologies," he says.

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