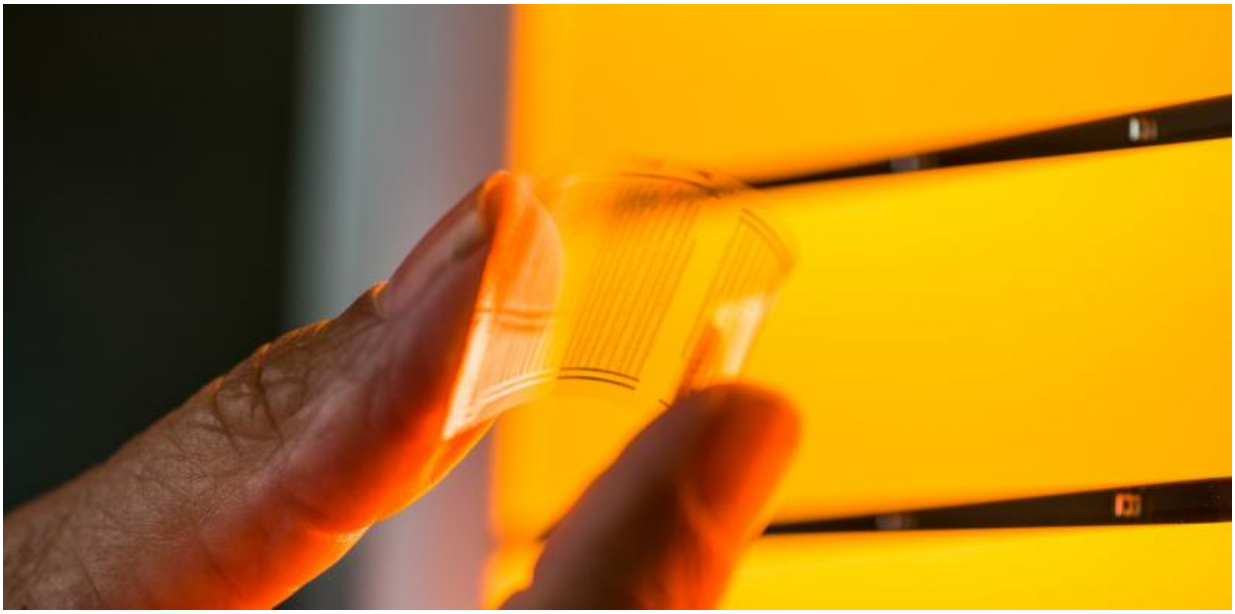
Why you should get ready to say goodbye to the humble lightbulb

June 14 2016, by Alison Walker



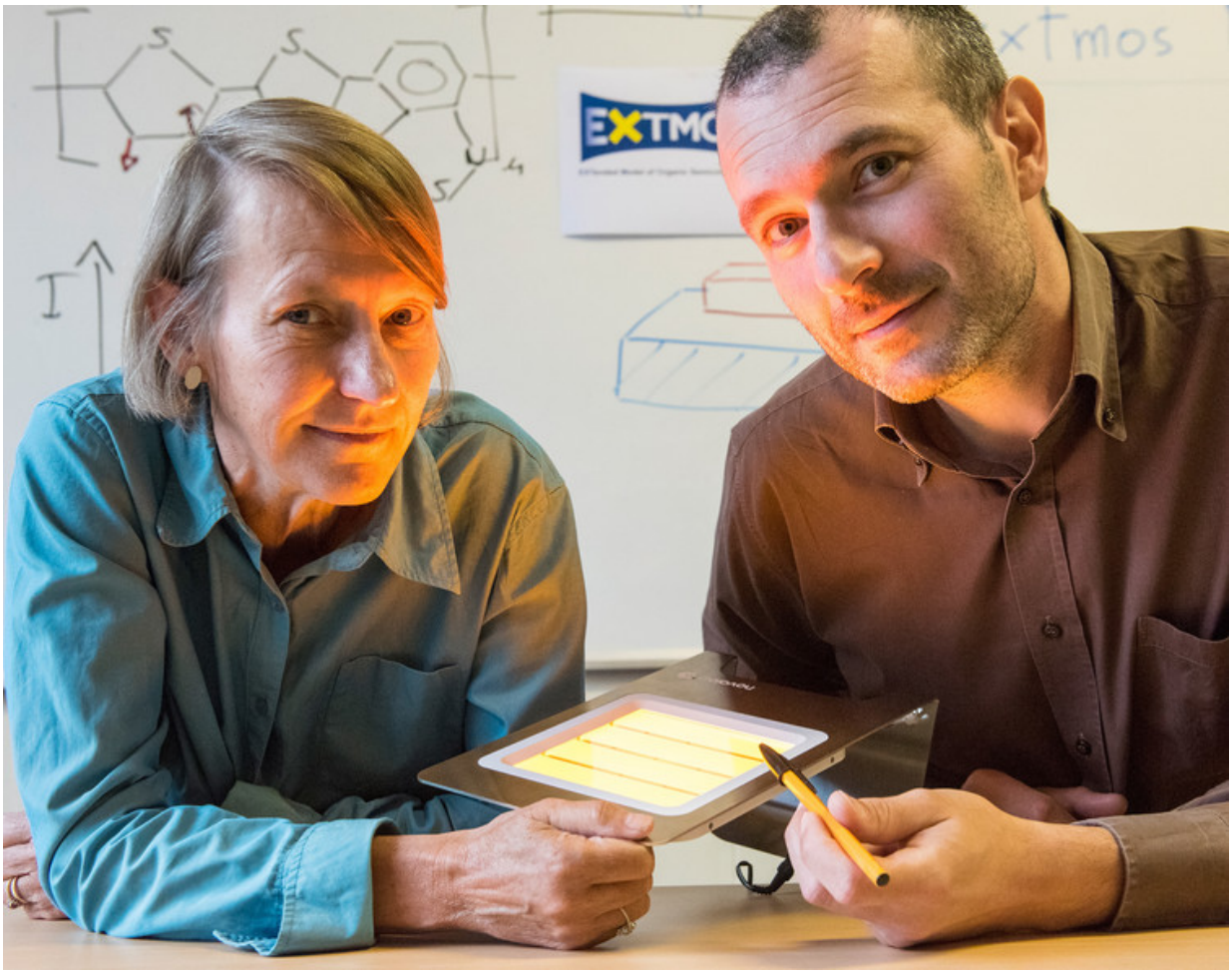
Credit: University of Bath

Lightbulbs are disappearing. The traditional incandescent bulbs that revolutionised daily life in the 20th century have largely already gone and the energy efficient fluorescent bulbs that replaced them are now also on their way out. In their place, we now have highly efficient light emitting diodes (LEDs), which are small semiconductor devices that produce light when an electric current is passed through them.

But even these are often arranged in a device that looks something like a conventional lightbulb. The technology that comes next could do away with the concept of rooms having a single light source and instead build light into the ceiling or walls themselves. This new type of organic LED (OLED) will redefine how we think about lighting.

OLEDs are not bulbs but films of layered organic semiconductors, meaning that they are made from carbon and hydrogen, just like organic life. There are two main families of OLED: those based on small molecules and those employing polymers. Organic LEDs aren't connected to organic food or farming but they are very efficient and do not contain toxic metals, such as mercury, so they are a green technology .

Conventional LEDs produce sharp points of light and cannot produce white light so LED bulbs usually mix different colours to approximate natural light but often do so with a blue tinge. In contrast, OLEDs emit a soft, diffuse light that's colour can be tuned to mimic natural light as closely as the old incandescent lamps. The technology provides fast switch-on times, wide operating temperatures and no noise.



Alison Walker and colleague Enrico Da Como experimenting with OLED panels. Credit: University of Bath

But perhaps the most interesting thing about OLEDs is that the films they are made from are just 0.3mm wide and can be moulded into flexible, transparent lighting panels and twisted into different shapes. This means OLED lights won't just be small fittings placed in the middle of a ceiling. Instead, they can be made in a variety of sizes and shapes and fitted to different parts of a room, or even used to create animated screens or wirelessly updatable wallpaper.

It also means they could be made using additive manufacturing processes – essentially printing the entire technology onto a wall or ceiling panel or other flexible base. This would reduce waste because you only print what you need and you can manufacture the lights locally, reducing their environmental impact. They also don't require the high temperature curing ovens used to make conventional LEDs.

An OLED lighting panel comprises multiple layers of organic material that are each tens of nanometers thick. These are sandwiched between two electrodes, a transparent conducting base layer and a metallic top layer. When electricity passes between these electrodes, it causes the organic material in between to emit light. Certain organic molecules in the layers act as "dopants" which determine the wavelength and so the colour of the light.

Bringing the cost down

Despite all the advantages of OLEDs, it may still take a while for them to take over from existing light fittings. The main reason we don't already have OLEDs in our homes is the price tag. Industry experts expect OLED lighting will become a major market by 2020-2023, when OLED panels are expected to cost €200 per square metre (down from €7,000 today).

Cheaper OLEDs should be made possible by developing faster manufacturing methods. We also need to find a way to ensure the blue light emitting molecules in OLEDS last as long as those that produce green and red emissions. OLEDWorks, a New York-based lighting company that bought the OLED division from Philips Lighting in 2015, already has several products with 50,000-hour lifespans, comparable to existing LED lights. Once these goals are achieved we should be prepared for any part of a room – or object within it – to light up when we flick the switch.

This article was originally published on The Conversation. Read the original article.

Source: The Conversation

Citation: Why you should get ready to say goodbye to the humble lightbulb (2016, June 14) retrieved 25 April 2024 from https://phys.org/news/2016-06-ready-goodbye-humble-lightbulb.html