Researchers roll out a new form of lighting

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In this month's edition of *Physics World*, Paul Blom and Ton van Mol from the Holst Centre in Eindhoven describe a way of creating thin, flexible sheets of organic light-emitting diodes (OLEDs) using a cheap, newspaper-style "roll-to-roll" printing process.

These bendable materials could oust the conventional light bulb and revolutionize the way we illuminate our surroundings, being used for everything from lighting tiles and strips in homes and offices to windows that can simulate sunrise and sunset.

Rather than the traditional solid, "inorganic" LEDs that we are used to seeing in display signs, traffic lights and car indicators, OLEDs can be easily dissolved in a solvent and so sprayed onto a roll of thin, flexible, plastic foil in the same way that newspapers are printed.

"Many companies recognize the potential of OLEDs and are investing heavily in research and development in the hope that when this technology finally takes off, they will be in pole position to take advantage," Blom and Van Mol write.

The bottom layer of an OLED, which acts as a support, is a flexible material such as a polymer foil that has the electrodes and the light-emitting layer sandwiched on top to make up the complete device. Each layer is between 5 and 200 nanometres thick.

Traditional LEDs have so far failed to become a viable alternative to light bulbs because, despite being highly efficient, they have to be

fabricated in clean rooms and so are expensive to make. But with about 20 per cent of the electricity the world consumes going on lighting, Blom and Van Mol state that any new, more-efficient lighting technology could greatly reduce global energy consumption.

OLEDs are poised to take over from the light bulb as their spray-on production makes them a faster and cheaper alternative to traditional LEDs and can be produced en mass through the "roll-to-roll" newspaper technique.

There are, however, several hurdles that need to be overcome before OLEDs become a commercial commodity, such as depositing the materials onto a thin film sheet with high precision, managing the properties of the different materials and, most importantly, keeping water out of the device – OLEDs have a barrier requirement up to a thousand times more demanding that food packaging.

Blom and Van Mol describe how their institution, along with several other research institutes and commercial companies, is at the forefront of combating these problems and delivering OLEDs into the hands of the consumer.

More information: *Physics World* - physicsworld.com/

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