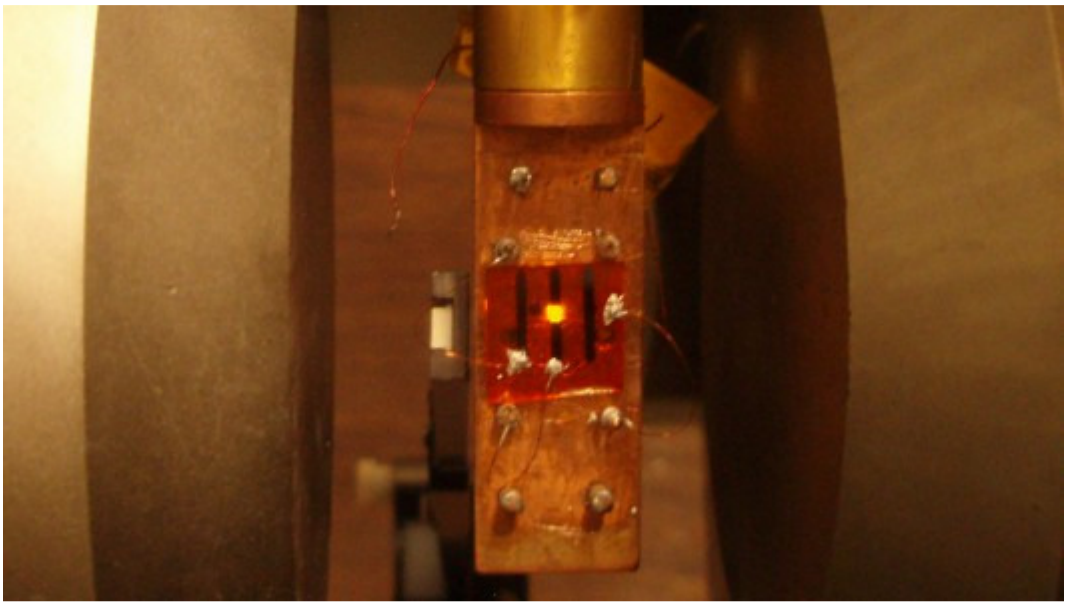
OLED based on Magnonics



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A new "spintronic" OLED glows orangish exposed to a magnetic field from the two poles of an electromagnet located on either side of the device

A research Organization has developed a new "Magnonics" organic light-emitting diode or OLED that promises to be brighter, cheaper and more environmentally friendly than the kinds of LEDs now used in television and computer displays, lighting, traffic lights and numerous electronic devices.

"It's a completely different technology," The researchers made a prototype of the new kind of LED – known technically as a spin-polarized organic LED or spin OLED – that produces an orange color. But they expect it will be possible within two years to use the new technology to produce red and blue as well, and he eventually expects to make white spin OLEDs.

However, it could be five years before the new LEDs hit the market because right now, they operate at temperatures no warmer than about minus 28 degrees Fahrenheit, and must be improved so they can run at room temperature.

In the new study, the researchers report two crucial advances in the materials used to create "bipolar" organic spin valves that allow the new spin OLED to generate light, rather than just regulate electrical current. Previous organic spin valves could only adjust the flow of electrical current through the valves.

The first big advance was the use deuterium instead of normal hydrogen in the organic layer of the spin valve. Deuterium is “heavy hydrogen” or a hydrogen atom with a neutron added to regular hydrogen’s proton and electron. They says the use of deuterium made the production of light by the new spin OLED more efficient.

The second advance was the use of an extremely thin layer of lithium fluoride deposited on the cobalt electrode. This layer allows negatively charged electrons to be injected through one side of the spin valve at the same time as positively charged electron holes are injected through the opposite side. That makes the spin valve “bipolar,” unlike older spin valves, into which only holes could be injected.

It is the ability to inject electrons and holes at the same time that allows light to be generated. When an electron combines with a hole, the two cancel each other out and energy is released in the form of light.

“When they meet each other, they form ‘excitons,’ and these excitons give you light.”

By injecting electrons and holes into the device, it supports more current and has the ability to emit light, he says, adding that the intensity of the new spintronic OLEDs can be a controlled with a magnetic field, while older kinds require more electrical current to boost light intensity.

Existing OLEDs each produce a particular color of light – such as red, green and blue – based on the semiconductor used. They says the beauty of the new spin OLEDs is that, in the future, a single device may produce different colors when controlled by changes in magnetic field.

He also says devices using organic semiconductors are generally less expensive and are manufactured with less toxic waste than conventional silicon semiconductors.

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