

Nanowires offer opportunities for improved LEDs

July 1 2011

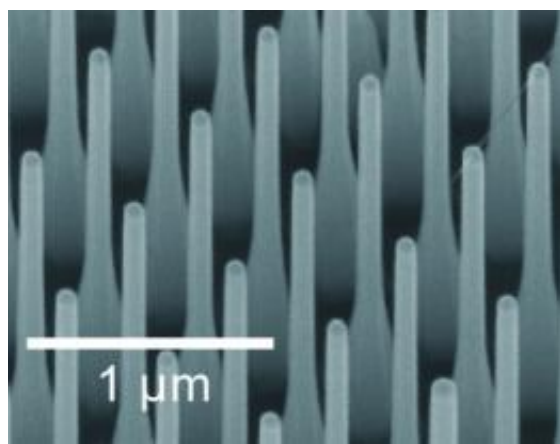


Figure 1. Electron microscope image of nanowires pattern

Researchers from Dutch FOM Institute AMOLF, together with colleagues from Philips Research, Eindhoven University of Technology and Delft University of Technology, have made special nanostructures that could be used as light-emitting diodes (LEDs). These nanostructures can be used to control the direction of the emission. Controlling the direction of the light is vitally important for increasing the efficiency of LEDs. It is also a step towards a new generation of LEDs that are based on semiconducting nanowires. The results of this research were recently published in the prestigious journal *ACS Nano*.

The direction in which a LED emits light is mainly determined by the surface between the LED and the surrounding air. As light can only

escape from the LED at small angles, the direction of emission is usually straight on (perpendicular to the surface). However this can be influenced by [nanostructures](#) in the surface of the LED. Inspired by these nanostructures, the researchers have developed a new technology with which the direction of the light can be changed.

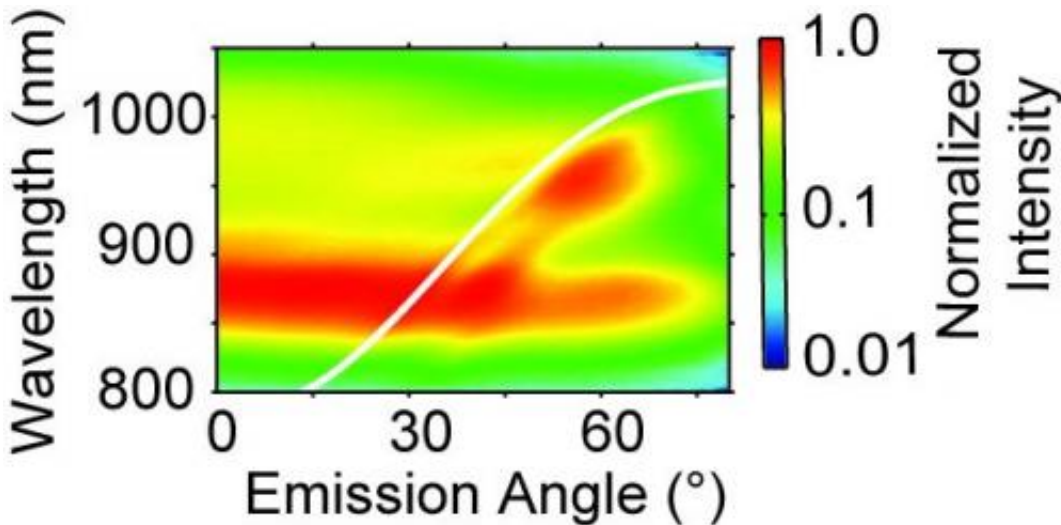


Diagram of the light intensity. Measurement of the intensity of the light emitted by the nanowires as a function of the wavelength (i.e. colour) and the angle of the light emitted. The maximum depends on the emitter, which is located in the nanowires. In this case it is at 950 nm and 55 degrees.

The new method consists of growing partially-emitting nanowires in an ordered pattern. This pattern forms a ‘photonic crystal’ that sends the [light](#) in specific directions. Furthermore, the researchers have shown that the emission can be optimised by a smart positioning of the emitting part within the nanowire. This knowledge could lead to an increased [efficiency](#) of LEDs. Moreover it provides opportunities for a next generation of LEDs, based on semiconducting nanowires.

More information: 'Controlling the directional emission of light by periodic arrays of heterostructured semiconductor nanowires', Silke L. Diedenhofen, et al. [DOI: 10.1021/nm201557h](https://doi.org/10.1021/nm201557h)

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