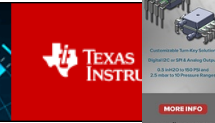


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Killing Covid-19 with UV-C LEDs

MARCH 18, 2020 BY LEE TESCHLER — 2 COMMENTS

Yes, light in the UV-C part of the spectrum will destroy the virus. Here are the basics and a few myths surrounding these light emissions.

For those of us still working, it can be a bit unsettling to ponder whether the surfaces we touch harbor a few virions left over from someone infected with Covid-19. When it's impractical to swab down everything with bleach, bathing with light in the UV-C part of the spectrum might be a useful alternative.

Light in the ultraviolet C band (100 to 280 nm wavelength) has long been used as a disinfection method in food, air,

and water purification. It works by destroying nucleic acids of microorganisms and disrupting their DNA. Unfortunately, conventional germicidal UV light is also a human health hazard leading to rapid sunburn or skin cancer as well as an inflammation of the cornea and cataracts. So it isn't used much in public spaces.

Nevertheless, UV-C lamps are readily available and can be safely used with inexpensive protective gear such as glasses.

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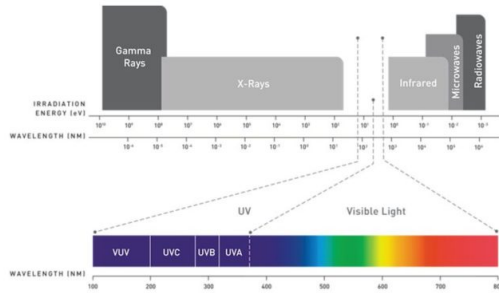
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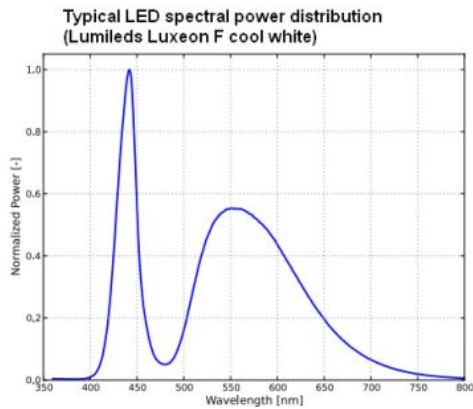
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The UV-C portion of the spectrum sits above that of UVA and UVB.

commercially available LEDs able to generate UV-C light. Like other kinds of LEDs, UV-C types last far longer than their non-solid-state counterparts. One proviso is that the electrical-to-UVC conversion efficiency of LEDs is currently lower than that of mercury lamps.



A typical LED output spectral graph, this one from a Lumileds device, shows a spectral peak at about 450 nm in the blue light area. PC-LEDs coat the LED surface with a phosphor that “pumps” the output lower in visible light frequencies. But some 450 nm light remains.

frequencies. PC-LEDs that operate this way are sometimes said to be high-CCT, 450-nm blue-pump types with the “pump” denoting the down-conversion process.

The myth is that UV light leaks out from beneath the yellow phosphor on the LED die. But our own tests, as well as tests conducted by the Dept. of Energy, have found no output in the UV-C range from garden-variety LED bulbs. Moreover, LED makers generally publish graphs of spectral response for the LEDs they provide. A review of these graphs shows that most of the output for LEDs designed for general illumination is at 450 nm wavelengths and longer. The

The usual means of generating UV-C for disinfection is most typically with a mercury-vapor lamp that produces light through use of an electric arc through vaporized mercury. These low-pressure lamps have a typical efficiency of approximately 30–40%. But recent developments in technology have led to

Unfortunately, there have been several myths about LEDs and UV light that still float around the internet. One is that ordinary LEDs for general-purpose illumination generate UV and even UV-C light as they age or just as a byproduct of their main illumination spectrum. Both assertions are false. They likely arise from misunderstandings about phosphor-converted white LEDs (PC-LEDs). These are created either from blue- or near-ultraviolet-emitting chips putting out light at about 450 nm that are coated with a yellow phosphor. The phosphor down-converts the light output into lower visible light

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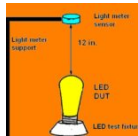


output at shorter than 400 nm is essentially nil. We looked at the published spectral response curves of general illumination LEDs made by several mainstream suppliers and we could find none that had any output at UV frequencies.

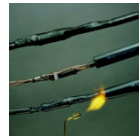
Those interested in UV-C lights have numerous choices available. A recent review of products available on Amazon.com revealed several 12-in-long UV-C lamps available for under \$20.

But if you plan on disinfecting surfaces around your workbench with this kind of light, note that the fact that UV-C radiation can break down chemical bonds leads to rapid aging of plastics, insulation, gaskets, and other materials. And plastics sold as "UV-resistant" are tested only for UV-B. This is a point to note because it takes a while to disinfect surfaces with a UV-C light. In one research study, it took a 30-minute exposure to a 40-W UV-C lamp to kill what the researchers called medically important bacteria.

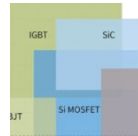
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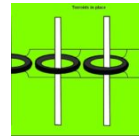
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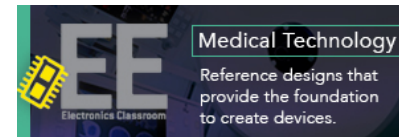
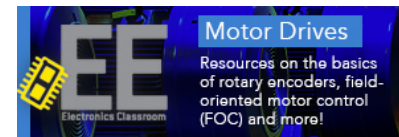
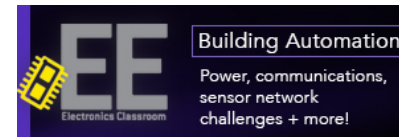
Amir says

MARCH 20, 2020 AT 11:17 AM

Commercially uv-c LEDs are available on the market from near 10 years ago , the big problem of these led types is:

1- output power range is very limited (common uvc leds are under 500mw range and this is not usable power on many applications with attempt to their very low efficiency (near

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10% compared compared to 30-40% of mercury vapour uv-c lamps and power ranged from 1W to hundred watts

2- price of these low power leds is very high when compared to other led types (IR – visible light , uv-a and b spectrum leds) . You can buy any led except uv-c in range of few ten to hundred watts for under 10 usd . An 200mw uv-c led tagged for 30 to 50usd or more from branded supplies!

This is an example of one cheap 200mw uv-c led for 25usd

<https://m.alibaba.com/product/60825075601/high-power-uv-c-led-265nm.html?s-p>



William K. says

MARCH 20, 2020 AT 2:50 PM

Thanks for an educational posting about the type and power level needed for germ killing, as well as pointing out the common confusion. The mercury vapor lights do have a real advantage in that they do not need an additional heat sink, while high powered LEDS certainly would need such..

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The advertisement features a dark blue background with a network of glowing blue nodes and lines. At the top left is a yellow microchip icon. In the top right corner, there is a small version of the ELV Series logo and product images. The main text reads 'EE Electronics Class' in large white letters, followed by 'MEDICAL TECHNOLOGY Training Center Classroom' in a smaller font. Below this, a paragraph describes the training center's offerings: 'This training center presents reference designs that provide the foundation to create devices — including ultrasound scanners, CPAP machines, ECGs, and wearable fitness and activity monitors.' At the bottom, there is a 'LEARN MORE' button with a play icon, and a sponsorship logo for Texas Instruments.

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Mar 19, 2020

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