

UVC LEDs: the light at the end of the tunnel?¹

UVC LEDs are one solution to contain the COVID-19 pandemic.

OUTLINE:

- The UVC² LED market could reach US\$2.5 billion in 2025 with a 61% CAGR³₂₀₁₉₋₂₀₂₅.
- Since its inception, the UV LED market has mainly been driven by UV curing applications.
- Competitive landscape:
Typically, LG Innotek and Seoul Viosys / Semiconductor have been key companies in getting the UVC LED market ready to emerge.
Leaders like Seoul Viosys and NFKG are expected to maintain their position in 2020 and 2021.
But recent new entrants are close behind...
- COVID-19 outbreak:
The pandemic has created momentum for the UVC LED⁴ industry.
It has created such a peak in demand that an overall shortage appeared across the entire UVC LED supply chain in 2020.
The overall industry is now looking to increase manufacturing capacity very rapidly.

*“It’s been more than 10 years that the industry has waited for this moment to happen, and all the players have worked hard to make it possible.” asserts **Pars Mukish, Business Unit Manager, Solid-State Lighting & Display at Yole Développement (Yole)**. “UVC LEDs are still much more expensive than traditional UV lamps, but manufacturers have got closer to the requirements of the early majority willing to use the technology. Indeed, from ~\$100/ mW in 2015, UVC LED prices reached \$0.3-2/ mW in 2019, which represents a real threshold for most potential large-volume integrators”.*

¹ Extracted from:

UV LEDs – Market and Technology Trends 2020 report, Yole Développement, 2020

UV-C LEDs at the Time of COVID-19 report, PISEO, 2020

² UVC or UV-C

³ CAGR: Compound Annual Growth Rate

⁴ LED: Light Emitting Diodes

According to **Joël Thomé, CEO of PISEO**: “Indeed, the analysis of the portfolio and roadmaps of UV-C LED manufacturers confirms the trends observed for several years: a rapid and regular drop in prices and a significant increase in performance (power and efficiency), which should allow UV-C LED to establish itself in the field of disinfection by UV-C radiation, at mid or long term depending on the applications”.

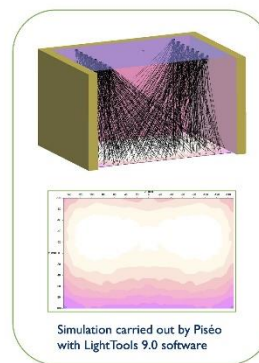
Designing UV-C LED systems - disinfection cabinet for medical equipment

(Source: UV-C LEDs at the Time of COVID-19 report, PISEO, 2020)

Optical design:

Dose	:	46 *	mJ/cm ²
Wavelength	:	265	nm
Minimum irradiance on the target	:	0.383	mW/cm ²
Uniformity parameter (min / medium)	:	75%	
Average irradiance on the target	:	0.51	mW/cm ²
Optical power on the target	:	306	mW
Optical efficiency (target / source)	:	42%	
Total optical power emitted by the sources	:	729	mW

* This value is based on the results of the study by Inagaki (Japan) published in July 2020: [Rapid inactivation of SARS-CoV-2 with Deep-UV LED irradiation]. From these results, Piséo estimated the dose by taking into account the environment to be treated (surface) and the level of disinfection to be achieved. The dose used here is only an example. It does not engage the responsibility of Piséo.



In this context, both companies, Yole and PISEO investigate disruptive LED technologies and related markets in depth, to point out the latest innovations and underline the business opportunities.

The [UV LEDs – Market and Technology Trends 2020 report](#) from Yole gives detailed analysis of the UVC LED market by disinfection application, of the UVC LED manufacturing cost and of the main UV LED applications. Including market forecast, supply chain, technology manufacturing, performance, price and industry analysis, this study reviews the global UV LED industry. This new report also studies COVID-19 pandemic’s impacts on the UV LED business. In parallel, the [UV-C LEDs at the Time of COVID-19 report](#) from PISEO points out the artificial and principles for integrating UV-C LEDs and sizing systems for disinfection, in relation to the required doses. This report studies the dimensioning and implementation of UVC LED systems for disinfection and the characterization of their germicidal efficiency. It also analyzes the regulations and standardization of the UVC LED in Europe and provides the state of the art of UVC LED technology and the outlook for performance changes, compared to traditional UVC sources.

What is the status of the UV LED industry? What are the economic and technological challenges? What are the key drivers? Who are the suppliers to watch, and what innovative technologies are they working on? How does the COVID-19 outbreak impact each UV LED market segment?

PISEO and Yole deliver today a detailed and comprehensive overview of this industry.

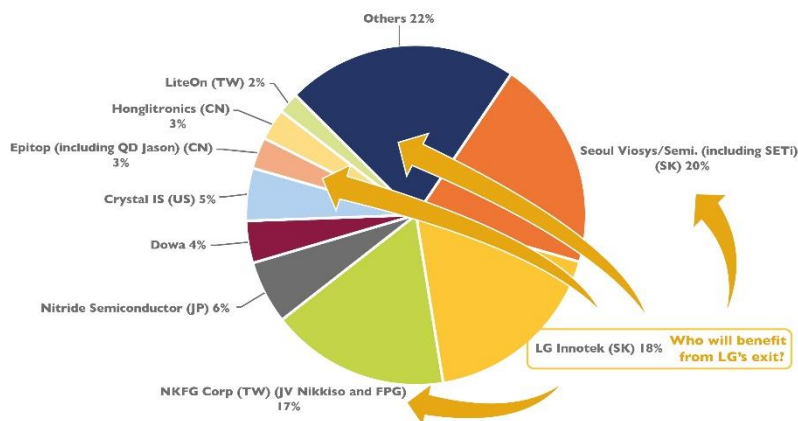
As analyzed by Yole’s team in the UV LEDs – Market and Technology Trends 2020 report, such trends were made possible by the entry of several new entrants from the visible LED industry. Typically, LG Innotek and Seoul Semiconductor have been key companies in getting the UVC LED market ready to emerge. But their destinies will be different. LG Innotek started exiting the business before the COVID-19 pandemic, due to more than 10 years of consecutive losses of its visible LED division. Seoul Viosys has made an IPO⁵ in what can be considered as the best timing ever, when the pandemic started and UV lighting was drawing the attention of the entire world. The entry of several pure packager and module players has also helped to accelerate technological development, and further reduce the gap between device manufacturers and integrators.

According to **Pars Mukish**: “The overall industry was therefore ready for a boom in the UVC LED market – but what has happened has gone way beyond their expectations. The COVID-19 pandemic has created such a peak in demand that an overall shortage appeared across the entire UVC LED supply chain in 2020. And as such trends in demand are likely to last, the overall industry is now looking to increase manufacturing capacity very rapidly. As of Q3-2020, already more than 300 million units of capacity have been announced to be installed in the short term”.

Financial gain will further intensify the competition and it’s likely that an industry experiencing such increase in demand will see big changes. We expect leaders like Seoul Viosys and NFKG to maintain their position in 2020 and 2021. But recent new entrants are close behind and will do their best to collect further market shares and catch orders left behind by LG Innotek.

2019 tentative UVC LED market shares

(Source: UV LEDs – Market and Technology Trends 2020 report, Yole Développement, 2020)



In the UV-C LEDs at the Time of COVID-19 report, **Joël Thomé from PISEO** asserts: “With the COVID-19 epidemic, many UVC products, mainly for surface and air disinfection,

⁵ IPO: Initial Public Offering

are appearing on the market. The current regulations and standards cover the safety aspects related to the use of these devices, but do not cover the disinfection aspect.”

For now, manufacturers of disinfection systems generally rely on scientific publications and have their products tested by microbiology laboratories as a guarantee of the quality of their product in terms of disinfection. However, even a laboratory test is not a guarantee for the user, as the test conditions may be different from the conditions of use (type of surface, etc.). Eventually, faced with the photo-biological risk, countries have decided to ban the sale and use of UV-C disinfection products outside the medical environment.

For Matthieu Verstraete, Innovation Leader ad Electronics & Software Architect at Piséo: *“The UV-C players are putting in effort and confirm a sustained performance increase for the coming years. Among them is Stanley, with its portfolio of UV-C LEDs at 265nm peak wavelength that will gain 25% to 45% in the coming three years. Knowing that the 265nm peak wavelength is technically more challenging regarding UV-C LED performance while, according to some studies, this wavelength provides a better disinfection effect than higher wavelengths, it is an example of how dynamic the UV-C LED market is.”*

All year long, Yole Développement and PISEO publish numerous reports dedicated to the lighting industry. In addition, experts realize various key presentations and organize key conferences.

Throughout the year, discover the numerous solid-state lighting-related reports. Make sure to be aware of the latest news coming from the industry and get an overview of our activities, including interviews with leading companies and more on i-Micronews. Stay tuned!

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About our analysts

Pars Mukish serves as a Business Unit Manager, Solid-State Lighting (SSL) & Display at Yole Développement (Yole). Pars' mission is dedicated to the development of SSL and Display activities (ie laser diode, LED and OLED). Pars actively assists and supports the development of strategic projects, working with leading customers of the company. He manages the on-going expansion of technical and market expertise of the SSL & Display team. This team interacts daily with leading companies of the industry, allowing analysts to collect a large amount of data and integrate their understanding of the evolution of the market with technology breakthroughs. Pars is also regularly involved in international conferences, giving presentations and delivering keynotes. Prior to Yole, Pars has worked as Marketing Analyst and Techno-Economic Analyst for several years at the CEA (French Research Center). Pars holds a master's in Materials Science & Polymers (ITECH - France) and a master's in Innovation & Technology Management (EM Lyon - France).

As part of the Photonics, Sensing & Display division at Yole Développement (Yole), **Pierrick Boulay** works as Market and Technology Analyst in the fields of Solid-State Lighting and Lighting Systems to carry out technical, economic and marketing analysis. Pierrick has authored several reports and custom analysis dedicated to topics such as general lighting, automotive lighting, LiDAR, IR LEDs, UV LEDs and VCSELs. Prior to Yole, Pierrick has worked in several companies where he developed his knowledge on general lighting and on automotive lighting. In the past, he has mostly worked in R&D department for LED lighting applications. Pierrick holds a master degree in Electronics (ESEO – Angers, France).

Matthieu VERSTRAETE is Innovation Leader and Electronics & Software Architect @ Piséo. He has more than 20 years of experience acquired mainly within the Philips group. In the early years, this experience led him to participate in the Netherlands in the development of set-top boxes for digital television and optical DVD playback and burning systems. He was also responsible for the technical specification of the Philips group's portfolio of drivers for LED lighting devices worldwide. Prior to joining Piséo, he was Global System Architect for LED outdoor lighting solutions from Signify (ex Philips Lighting). Within Piséo, he directs and participates in studies of innovative photonic systems for all fields of application. His role as a system architect leads him to analyze applications and propose technical solutions that integrate the most recent photonic and electronic components and software bricks.

Joël Thomé is General Manager & Innovation Consultant at PISEO. He has more than 25 years of industrial experience in the field of innovation. For many years, he held international positions in R&D and business line management within the lighting division of the Philips group. He notably participated in the transformation of the company's product portfolio through the integration of LED technology and lighting control functions. Joël Thomé has been managing and developing Piséo since 2013 and regularly conducts market and state-of-the-art technological studies in collaboration with the company Yole Développement.

About the reports

UV LEDs – Market and Technology Trends 2020

UVC LEDs are one solution to contain the COVID-19 pandemic, possibly making the market increase tenfold and reach \$2.5B in 2025. – Performed by Yole Développement

Companies cited:

Advanced Ultraviolet Optoelectronics, Alpha One, American Opto Plus, Atomic Blue, Bioraytron, Bolb Inc., Brightek Optoelectronic, Bytech Electronics, ConvergeEver, CrayoNano, Crystal IS, Dowa, Edison Opto, Epigap Optotronic, EpiLEDs, Epistar, Epitop, Everlight, Genesis Photonic Inc., Guangzhou Hongli Optoelectronic, Harvatek, Hexatech, High Power Lighting, Hubei DUVTek, Inolux, ISON, Lattice Power, Ledtech, Lextar, Light Avenue, LiteOn, Lumens, Lumex, Luminus Devices, MarkTech Opto, Marubeni America Corp., NationStar, Nichia, Nikkiso, Nitride Semiconductors, Nitride Solutions, NKFG Corp, Opto Diode, Para Light Electronics, Photon Wave, Point Engineering, ProLight Opto, QD Jason Electric , QT Brightech, Sanan, Semicon Light, Seoul Viosys , SETi , Shenzhen Taoyuan Electron, Shenzhen Tianshengda Optoelectronic, Shenzhen UVET Electronics,

Stanley Electric, Sunpu Opto, Toyoda Gosei, UV Photonics, UVON, Violumas , Vishay, Yes LED, Zhuhai Tianhui Electronic, and more...

UV-C LEDs at the Time of COVID-19

In the current context of health crisis due to the SARS-CoV-2 virus, the need to prevent contagion through disinfection has become a major issue. Like other coronaviruses, this new virus can be destroyed by UV-C radiation. With the emergence of UV-C LEDs, the question of the relevance of using this technology to stop the current epidemic arises. – Performed by PISEO

Related reports:

- [VCSELs – Market and Technology Trends 2020](#)
- [MicroLED Displays – Intellectual Property Status & Landscape 2020](#)
- [Emerging Semiconductor Substrates: Market & Technology Trends 2019](#)

About Yole Développement

Founded in 1998, Yole Développement (Yole) has grown to become a group of companies providing marketing, technology and strategy consulting, media and corporate finance services, reverse engineering and reverse costing services and well as IP and patent analysis. With a strong focus on emerging applications using silicon and/or micro manufacturing, the Yole group of companies has expanded to include more than 80 collaborators worldwide... [More](#)

About PISEO

PISEO is an independent Innovation Centre which specializes in the analysis, design, realization and characterization of illumination, detection and imaging systems which integrate the most advanced photonic technologies. Located in France and created in 2011, the company brings together 14 employees and an accredited test and characterization lab... [More](#)

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