**Press Release**
November 29, 2021
LYON, France

# UV LED: After the impact of the COVID-19 pandemic, what is the status of this industry?[1]

***The UV lighting market will double or treble in size in the next five years, driven by disinfection and new functionalities.***

**OUTLINE:**

- Market forecasts:
  The UV lighting market is expected to reach US$3.5 billion in 2026, with a 17.8% $CAGR^{2}_{2021\text{-}2026}$.
  The UV LED market is expected to grow to US$2,466 million in 2026.
- COVID-19 outbreak:
  Several new UVC lighting applications, products, and systems have been developed: each having potential preferences for UV lamps or UV LEDs.
  The COVID-19 pandemic has positively impacted the UV lamp market and increased the share of UVC applications.
  PISEO identified 15 more UV-C LED manufacturers compared to 2020.
- Competitive landscape:
  Overall, UVC lamp manufacturers benefit enormously from the COVID-19 pandemic.
  With the situation created by COVID-19 and the related momentum for the UVC LED industry, several prominent players are willing to develop their UVC LED technology.

*"There is good in everything bad"*, asserts **Pars Mukish, Business Unit Manager, Solid-State Lighting & Display at Yole Développement (Yole).** *"For example, The COVID-19 pandemic has created some perfect use-cases for UV lighting technologies to spread throughout a rapidly changing disinfection market."*

Indeed, SARS-COV-2, the virus that causes COVID-19, has one of the highest reproduction/transmissibility rates among all viruses that have emerged in our modern society. To reduce the spread of the disease, light in the UVC wavelength band, which can deactivate

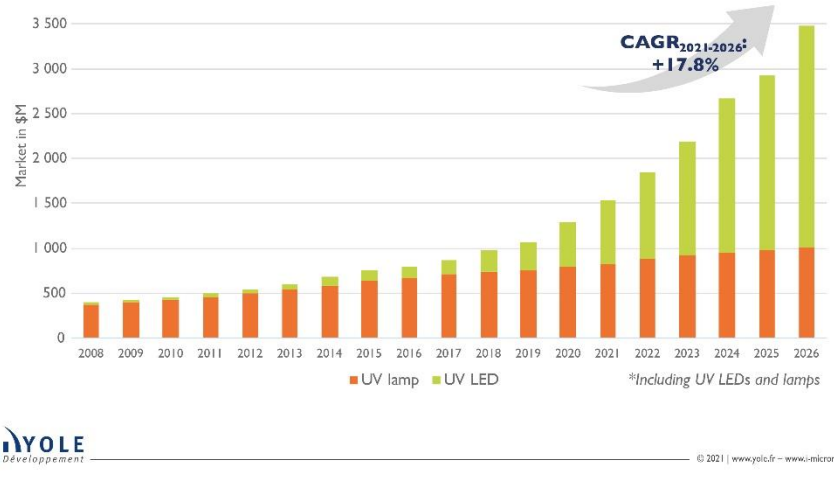
[1] Extracted from:
- UV LEDS and UV Lamps – Market and Technology Trends 2021, Yole Développement, 2021
- UV-C LEDs in the Time of COVID-19 - Analysis report on markets & technologies – Update November 2021, PISEO

[2] CAGR: Compound Annual Growth Rate

bacteria and viruses through physical methods, has gained unprecedented attention. Overall, there will be a "before" and an "after" the COVID-19 pandemic for the UV lighting industry.
According to **Joël Thomé, CEO of PISEO**: *"Indeed, the health crisis due to the SARS-CoV-2 virus has generated unprecedented demand for the design and manufacture of disinfection systems using optical UV rays. LED manufacturers have seized this opportunity, and we are currently seeing an explosion in UV-C LED products."*

**2008-2026 UV light source market***

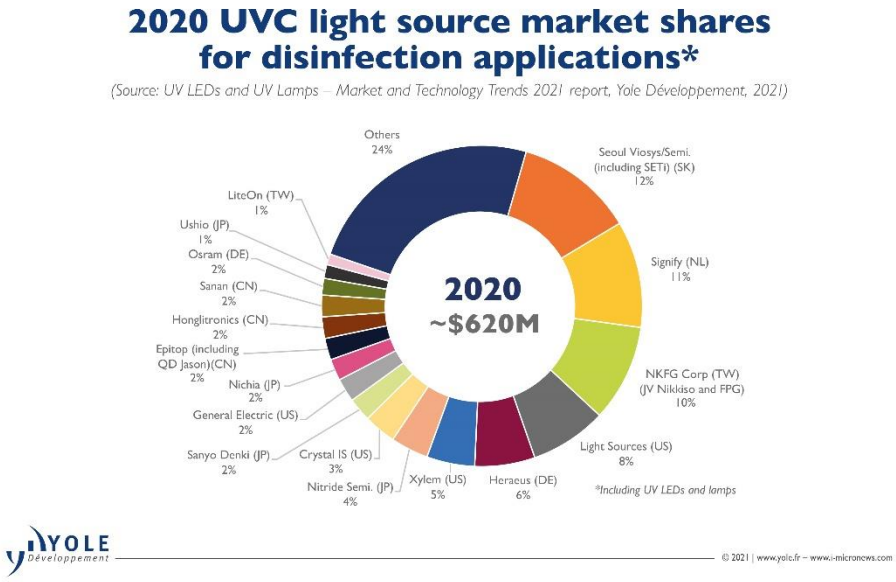
*(Source: UV LEDs and UV Lamps – Market and Technology Trends 2021 report, Yole Développement, 2021)*






In this context, the two companies Yole and PISEO combined their expertise to investigate the disruptive LED technologies and related markets in depth. The partners highlight the latest innovations and underline the business opportunities. They analyze the latest technology and market trends in the specific context of the COVID-19 pandemic, which has strongly impacted the UV industry in general.
Released today, the UV LEDs and UV Lamps – Market and Technology Trends 2021 report from Yole is a comprehensive survey of UV light sources, providing a deep understanding of the UV lamp and UV LED businesses. It also reviews and details the traditional UV lamp market, its main applications and associated characteristics, the market metrics, leading players' positioning and strategies. Considering the impact of the COVID-19 pandemic on all aspects, Yole's report reviews the overall UV LED industry and provides insights into changes in the value/supply chain after the penetration of this disruptive technology
In parallel, the UV-C LEDs in the Time of COVID-19 - Update November 2021 from PISEO discusses the technical state-of-the-art of UV-C LEDs and possibilities for further development of performance and price. This technical analysis offers a comparative overview of the products of the 27 leading UV-C LED manufacturers.
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.



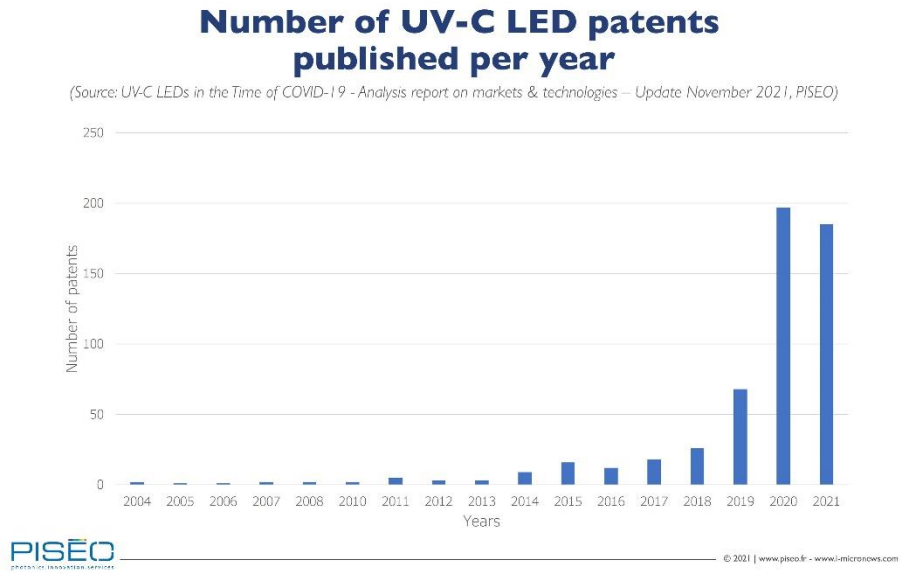

As analyzed in the new UV LEDs and UV Lamps – Market and Technology Trends 2021 report, on the one hand, UV lamps are historic, established, and mature technologies in the UV lighting market. Business before the COVID-19 pandemic was driven mostly by polymer curing with UVA wavelength light and water disinfection with UVC light. On the other hand, UV LED technologies are still emerging. Until recently, business was mostly driven by UVA LEDs. It was only a few years ago that UVC LEDs reached the performance and cost specifications of early adopters and started generating revenue.

According to **Pierrick Boulay, Senior Technology & Market Analyst, Solid-state Lighting at Yole**: *"Both technologies will benefit, but on different timelines. In the very short term, UV lamps might dominate end-systems because they are already established and easy to integrate. However, this proliferation of applications is a catalyst for the UV LED industry that will further push the technology and its performance forward. In the middle-to-long term, several end-systems might further adopt UV LED technology".*

The UV lighting market overall was worth around US$400 million in 2008. By 2015 UV LEDs alone were worth US$100 million. In 2019, the total market reached US$1 billion as UV LEDs spread into UV curing and disinfection. The COVID-19 pandemic has then driven demand, increasing total revenues by 30% in just one year. In this context, Yole's analysts expect the UV lighting market to be worth US$1.5 billion in 2021 and US$3.5 billion in 2026, with a $CAGR_{2021\text{-}2026}$ for this period of 17.8%.

Numerous industries and players supply UV lamps and UV LEDs. Signify, Light Sources, Heraeus, and Xylem/Wedeco are the top four UVC lamp players, while Seoul Viosys and NKFG are currently leading the UVC LED industry. There are few overlaps between the two

industries. Yole's analysts expect this to remain the case even though some UVC lamp players, such as Stanley and Osram, are diversifying their activities into the UVC LED field.
Overall, the UVC LED industry is likely to be the most transformed by recent trends. The industry has waited for more than 10 years for this moment to happen. All the players are now ready to grab a piece of this booming market.




Another factor can also be further analyzed to get a better understanding of the UV LED industry
The number of UV-C LED-related patents filed in the last two years has exploded, thereby illustrating the dynamism of research in this area, states PISEO. In its new UV-C LED report, PISEO offers a particular focus on key patents of 4 LED manufacturers. This selection is relevant as it highlights the main challenges of the rollout of this technology: intrinsic efficacy and cost. Yole also offers a complementary analysis of the patent landscape.
The need for disinfection and the opportunity to use small light sources enabled the creation of increasingly compact systems. This evolution, including new form factors, has clearly generated renewed interest on the part of LED manufacturers. Wavelength is also a key parameter for germicidal efficiency and optical risk assessment.
In the UV-C LEDs in the Time of COVID-19 - analysis report, **Matthieu Verstraete, Innovation Leader and Electronics & Software Architect at PISEO,** explains: *"Although currently relatively scarce and expensive, several system manufacturers, such as Signify and Acuity Brands, are taking a close interest in sources emitting a 222 nm wavelength due to the harmlessness of this optical radiation on the human body. Several products have already been placed on the market, and there are more to come which integrate excimer sources made by the company Ushio.*

PISEO's specialists are therefore reviewing the state of medical research, the technology of sources emitting at 222 nm, the germicidal effect of this wavelength, the regulatory environment, and the roadmaps produced.

*All year long, Yole Développement and PISEO collaborate to 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!*

## Press contacts

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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 (i.e., 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 ongoing 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 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).

**Pierrick Boulay** is a Senior Technology & Market Analyst in the Photonics and Sensing Division at Yole Développement (Yole). Pierrick works in the fields of Solid-State Lighting and Lighting Systems, carrying out technical, economic, and marketing analyses. In addition, he leads the automotive activities within the company. Pierrick has authored several reports and custom analyses on topics such as automotive lighting, LiDAR, sensing for ADAS vehicles, and VCSELs. Prior to Yole, Pierrick has worked in several companies where he developed his knowledge of lighting and automotive. In the past, he has mostly worked in R&D departments on LED lighting applications. Pierrick holds a master's degree in Electronics (ESEO – Angers, France).

**Matthieu Verstraete** is Innovation Leader and Electronics & Software Architect at PISEO. Matthieu Verstraete 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. In collaboration with Yole Développement's team, Joel Thome performs numerous technical and market analyses focusing on Photonics based solutions, in addition to developing innovative optical solutions with PISEO's R&D team. With a master's degree in mechanical engineering, Joel has been working in the lighting industry for more than 25 years. After beginning his career at Philips Lighting, he has recently held various global business, marketing and R&D senior management positions. During this period, he developed strong expertise in lighting controls, LED technology and innovation processes including general management, strategic road mapping and product portfolio management.

## About the reports

**UV LEDs and UV Lamps – Market and Technology Trends 2021**

*The UV lighting market will double or treble in size in the next five years, driven by disinfection and new functionalities.* – Performed by Yole Développement

**Companies cited:**

Advanced Ultraviolet Optoelectronics, Alpha One, American Opto Plus, Atomic Blue, Bioraytron, Bolb Inc., Brightek Optoelectronic, Bytech Electronics, ConvergEver, 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, and more…

**UV-C LEDs in the Time of COVID-19 - Analysis report on markets & technologies – Update November 2021**

# Press Release

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**Companies cited:**

Acuva, American Opto Plus, AquiSense Technologies, Bioraytron, Bolb, Corning, Cree, Crystal IS, Delta Airlines, Dietal, Dowa, DUVTek, Edison Opto, Everlight, GoodFellow, HCEN, Hexatech, Hönle, Hytecon, Hyundai, KnightOptical, KoppGlass, Lattice Power, Ledil, Legrand, LG-Innotek, Light Avenue, Lite-On, Lumex, Lumileds, Luminus, NationStar, MetaWater, Nichia, Nikkiso, Nitride Semiconductors, Osram OS and many more…

## Related reports

- VCSELs – Market and Technology Trends 2021
- Edge Emitting Lasers – Technology and Market Trends 2021

## 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, as 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 a French independent Innovation Center that helps industrial companies to innovate by providing analysis, design, realization and characterization services for illumination, detection, and imaging systems. Created in 2011 under the leadership of Yole Développement, its main shareholder, the company has successfully carried out 200+ customer projects and 4000+ characterization tests in its accredited lab. Active in many application fields, such as personal devices, domestic appliances, defense and security, automotive and transportation, general lighting, healthcare and well-being, PISEO has about 150 regular customers, including global leaders and high-tech start-ups… More

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