Noctiluca S.A.

FV: PLN 208.62 | Initiating Coverage | Rating: N/A

Noctiluca S.A. (NCL) is a material science company with own laboratories in Poland and South Korea, which was spun off from the Torun-based chemical company Synthex Technologies in 2019. It specializes in the development of next-generation OLED emitters, which are a kind of powder that form the fundamental basis of OLED displays of e.g. TVs, smartphones, mobile devices and lighting. So far, Noctiluca has developed >1,200 proprietary chemical materials and has patented c. 400. The company has already signed co-operation agreements with some of the largest worldwide display and consumer electronic companies. Based on our valuation model (50% value based on funding rounds of peers, 50% value based on a comparison with market leader Kyulux), we have determined a fair equity value for Noctiluca of PLN 324.92m/PLN 208.62 per share. This compares to a current market capitalization of PLN 188.46m. As there is strong demand for next-gen OLED technologies, we expect a takeover of Noctiluca within the next 4 years. The main risks, which we see, are: 1. The inability to raise additional funding for financing operations until break-even (exp. in H2/24E), and 2. Still high costs of OLED compared to LED.

NCL's monetization strategy foresees revenues from selling own OLED emitters and other high-performance materials and R&D work for third parties. So far, the company has signed co-operation agreements with renowned research institutions e.g. Fraunhofer IAP and 8 out of the 10 largest producers of consumer electronics worldwide e.g. LG. Noctiluca, which has a cash burn of c. PLN 410k/month and likely generated revenues from sale of product & services of c. PLN 850k in 2023, uses a proprietary AI algorithm for the discovery of emitters, which are a necessary component of every OLED display.

The OLED market, in which NCL operates, was valued at USD 38.4bn in 2022 and is expected to double by 2026E. While most smartphones already have OLED displays, there is still significant growth potential in the area of TVs, lighting and other displays. The advantages of OLED include e.g. an improved image quality, lower power consumption and a simpler design that enables the manufacturing of ultra-thin, flexible, foldable and transparent displays. NCL focuses on next-gen (TADF & Hyperfluorecence) emitters and complementary chemical high-performance materials.

in PLNm	2019	2020	2021	2022	2023E	2024E
Net sales	0.88	0.67	0.56	1.03	0.85	4.67
EBITDA	-0.12	-1.33	-2.03	-2.39	-3.38	-2.08
EBIT	-0.13	-1.35	-2.34	-2.81	-4.78	-3.99
Net income / loss	-0.13	-1.40	-2.37	-2.85	-4.72	-3.95
EPS	-0.08	-0.90	-1.52	-1.83	-3.03	-2.41
DPS	0.00	0.00	0.00	0.00	0.00	0.00
Dividend yield	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ROE	-51.16%	-50.89%	-49.09%	-144.05%	-127.69%	-40.50%
Net gearing	-14.82%	-92.85%	-84.05%	-45.90%	-60.72%	-66.55%
EV/Sales	n.a	n.a	n.a	177.42x	215.64x	39.25x
EV/EBITDA	n.a	n.a	n.a	neg	neg	neg
P/E	n.a	n.a	n.a	neg	neg	neg

Company profile

Noctiluca S.A. is a Polish deep-tech material science company.

Date of publication	15 January 2023 / 6:30 am
Website	www.noctiluca.eu
Sector	Material Science
Country	Poland
ISIN	PLNCTLC00018
Reuters	NCL.WA
Bloomberg	NCL PW

Share information

Last price	121.00
Number of shares (m)	1.56
Market cap. (PLNm)	188.46
Market cap. (EURm)	43.25
52-weeks range	PLN 159.80 / PLN 93.60
Average volume (shares)	1,232

Performance

4-weeks	16.35%
13-weeks	11.21%
26-weeks	-1.14%
52-weeks	1.00%
YTD	3.42%

Shareholder structure

Synthex Technologies Sp. z.o.o	32.65%
Mariusz Bosiak (CEO)	6.42%
Polski Instytut Badan i Rozwoju Inwestycje	6.23%
ASI ValueTech Seed	6.23%
Free float	48.47%

Financial calendar

Q4/23 report (exp.)	February 13, 2024

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Investment Case

- Noctiluca S.A. (NCL) is a deep-tech material science company, which develops and produces advanced chemical compounds in the area of photonics. They include Thermally Activated Delayed Fluorescence (TADF) compounds that are used in 3rd and 4th generation of OLEDs (Organic Light-Emitting Diodes) as well as in the latest (5th) generation of OLED based on Phosphor Sensitized TADF (PST) and Phosphor Sensitized Fluorescence (PSF) that NCL is developing. In addition, Noctiluca develops supplementary chemical high-performance materials, which make up most of the emission layer.
- The emitters and auxiliary materials, which have the form of powder, are key components of the structure of OLED devices (e.g. in smartwatches, TVs, wearables) and responsible for luminescence. Their parameters are crucial for the quality of the image displayed using OLED technology, the saturation of color, and the intensity of light.
- NCL, which operates own laboratories in Poland and South Korea, generates most of its revenues from its own high-performance materials (including emitters). So far, Noctiluca has established co-operations with more than a dozen scientific institutions (e.g. German Fraunhofer IAP, ITRI that is the most important development agency for high-tech and industry in Taiwan) and industrial clients (e.g. LG Display, the largest watch producer from Switzerland, the world's largest manufacturer of Telco devices from China, the world's largest consumer electronics manufacturer from the US and few other TOP10 OLED display manufactures).
- The OLED market was valued at USD 38.4bn in 2022 and is expected to grow at a CAGR of 21% by 2032E. The main growth drivers are the high energy efficiency and environmental friendliness of the technology. While the latest smartphones are already equipped with OLED displays, the growth potential in other segments, e.g. lighting is still significant. According to various research firms, the display market, which accounts for >80% of OLED use, was valued at USD 125-160bn in 2022 (CAGR 3.5%-7% by 2032E). Thereof, LCD displays, which will likely be replaced by OLED, accounted for c. USD 100bn.
- Since its debut in the NewConnect segment of the Warsaw Stock Exchange in 2022, Noctiluca's share price has increased by 332%. In 9M/23, the company's revenues reached PLN 318k, its EBITDA PLN -3.1m and net income PLN -4m. While for 2023E we predict total revenue of PLN 850k and an EBIT of PLN -4.8m, in 2024E we believe that due to existing MTAs (Material Transfer Agreements) and a likely JDP (Joint-Development Project) with LG revenues will strongly accelerate to PLN 4.7m and the company will reach the monthly break-even in the end of 2024E/beginning of 2025E. However, given a cash position of PLN 3.3m at the end of September 2023 and a cash burn of c. PLN 410k/month, we believe that Noctiluca will have to conduct another capital increase in H1/24E.
- We initiate coverage of Noctiluca S.A. with a FV of PLN 208.62 per share. Our valuation is based on a weighted average of a value based on funding rounds of peers (50%) and a value based on a comparison with NCL's main competitor Kyulux (50%). We like Noctiluca's committed management team and the fact that despite NCL's young age it has already been able to establish an impressive network of scientific and industrial partners. In our view, the company will be taken over by one of the larger producers of displays within the next 4 years as they are actively seeking exclusive access to innovative OLED technology. When it comes to risks, we would like to emphasize especially the dependence on external funding and still high costs of OLED compared to other technologies.

SWOT Analysis

Strengths

- Innovation leader in the area of OLED emitters, whose use in the electronics industry is growing rapidly due to their energy efficiency, flexibility and eco-friendliness
- A new competitor would need many years to gain the same level of technological know-how as Noctiluca
- More than a dozen co-operation agreements with renowned scientific institutes and the largest producers of displays and consumer electronics
- Low cash burn and close co-operation with leading players from the display and lighting industry
- CEO and COO have been working together for >10 years
- Strong communication with capital market participants
- Financial support by the main shareholder Synthex
- Global authorities in the display industry on the advisory board

Weaknesses

- Relatively low number of patents
- Noctiluca is still dependent on external financing
- Listing in the alternative Newconnect segment, which is less regulated and where many institutional investors are not allowed to invest

Opportunities

- Large target market
- The value of the OLED market was estimated at USD 38.4bn in 2022 with a CAGR of 21% in the coming years
- Sales of proprietary OLED emitters to large consumer electronics or display manufacturers
- Start of a joint-development project with LG Display in 2024E
- Potential reduction of OLED production costs by int-jet printing technique
- Change to the main market of the WSE, which would allow more institutional investors to invest in Noctiluca
- Takeover of Noctiluca by a global display manufacturer in the future

Threats

- OLED displays are still more expensive than LCD
- Liquidity risks
- Dilution risks
- Risks that in the long run a better technology than OLED will be developed
- Risks related to technology theft
- Difficulties in recruiting qualified staff
- Uncertainty regarding R&D activities

Valuation

We have valued Noctiluca using a comparable companies technique that was divided into two categories: Valuation based on funding rounds of peers (50%) and valuation based on a comparison to the market leader (50%). In our view, Universal Display Corporation, which has a market cap of USD 8.4bn and in 2022 generated revenues of USD 616.6m, is not comparable to NCL as the US-based company is the global market leader in the area of old 1st and 2nd generation OLED emitters. However, we believe that it could be a reference for NCL as it shows the market potential of 3-5 generation products.

We have refrained from using income-based valuation methods, given the challenge of forecasting the anticipated economic benefits generated by the company in the future. The TADF technology is gradually advancing, but due to several uncertain factors with many beyond Noctiluca's direct control, we have decided to use comparable companies' valuation. The value of Noctiluca is closely tied to its valuation by OLED panel manufacturers.

Valuation based on funding rounds of peers

Date	Company name	Total Raised (in USDm)	Stake %	Pre-money valuation (in USDm)	Post-money valuation (in USDm)	Notes
2011	Cynora	4.28	52%	3.97	8.25	Series A
2017	Cynora	29.83	24%	95.66	125.49	Series B
2019	Cynora	25	15%	142.85	167.85	Series C
02/2022	CREDOXYS	1.38	16%	7.19	8.57	Seed round
08/2023	beeOLED	14.43	39%	22.44	36.87	Series A
11/2023	CREDOXYS	Undisclosed	18%	n.a	n.a	Pre-Series A
Average				**54.42**	**69.41**	

Source: German national court registry, company's websites, CapitalIQ, East Value Research GmbH

To use this valuation method, we have utilized German national court registry, and public announcements. Details are provided above.

First, we have examined past M&A transactions in the OLED materials industry. Due to the innovative technology Noctiluca is developing there is just one past transaction that closely resembles what Noctiluca is doing: The acquisition of Cynora by Samsung for USD 300m in 2022, whereby some industry experts suggest that the price for Cynora's IP was USD 100m.

In 2016, Cynora started a Joint Development Project (JDP) with LG Display and in 2018 had a next-generation blue OLED emitter with EQE 20% (today's standard >30%) and expected commercialization plans in 2020. In 2019, Cynora was valued at USD 167.85m and the company hired a new CEO to help with the commercialization of its next-gen blue emitter but in the end failed to do so. In 2020, it indeed introduced its first commercial product - a blue emitter - but from older generation. As due to rising operational costs - in 2021, it generated a net loss of EUR 19.2m with over 100 employees - Cynora was seeking different ways to become solvent, the close cooperation with Samsung turned out to be a lifesaver for its investors. In 2022, Samsung acquired the research company for about USD 300m, but effectively was seeking only its IP, as the company was liquidated shortly afterwards.

When it comes to funding a technology material company, it is important to distinguish investments made by financial investors (mostly VCs), and strategic investors (OLED manufacturers). Strategic investors such as LG or Samsung might value companies much more because of synergies and the possibility to fully utilize the potential of the material company's developed projects.

New start-ups have also joined the race to create a next generation deep-blue OLED emitter and other innovative materials for the OLED industry. CREDOXYS that was established in 2021 in Dresden, completed its first funding round in that year, receiving funds from the German government, among others. In 2023, the company completed its pre-series A round with various VC funds for an undisclosed amount. beeOLED, which is also based in Dresden and was founded in 2020, has recently raised USD 14.4m resulting in a post-money valuation of USD 36.9m. As of now, beeOLED solely focuses on developing a next-generation deep-blue emitter. In a recent interview, its CEO stated that the company's emitters would be tested by business partners in 2024E and there were still 3-4 years until its emitters would be fully commercialized. For comparison: Noctiluca's own emitters have been tested by leading display manufacturers at least since 2022.

We believe that all the high-performance materials (including deep blue emitters) from the above mentioned companies are at a similar technological level to Noctiluca. As beeOLED is further away from commercialising its emitters, Noctiluca should currently be valued more. Cynora was valued at c. USD 96m, a year later after starting its JDP with LG Display. NCL plans to establish a JDP with LG Display in late 2024E. What differentiates Noctiluca from its competitors and is positive in our view, is the diversification of its business partners. Additionally, the aforementioned three German companies solely focus on developing a particular material (2 of them focus only on the deep-blue next-gen OLED emitter), while Noctiluca is developing materials for various layers of OLED stack. Additionally, Noctiluca develops business relationships not only with the market leaders, but also with smaller players, helping them not only with materials R&D, but also with the development of their products. Having analysed the development phases of Noctiluca's competitors excluding the market leader, we have valued Noctiluca at an equity value of USD 70m.

Valuation based on a comparison to the market leader

In addition, we have analysed how does Noctiluca compare with the independent next-generation OLED materials leader, Kyulux. Our valuation is based on four key factors: team (20% weight), products (20%), commercialization process (10%), and intellectual property (50%).

Team

Kyulux: In its management, Kyulux has a highly experienced team specializing in OLED development/materials. Additionally, its founder Mr. Adachi is the inventor of an OLED TADF device with multiple patents and innovative materials discovered and is widely regarded as the top researcher in OLED technology. Kyulux has an R&D centre in Boston, close to the Massachusetts Institute of Technology, and thus has access to the best technical graduates in the world.

Noctiluca: The Torun-based company has a relatively young team, but its management consists of experienced scientists and VC managers, who facilitate the commercialization of its materials. In addition, NCL has very experienced and renowned advisors, including Prof. Kwon, a former chief researcher at Samsung SDI. Additionally, by working with the world's leading research centres, the NCL team is able to gain valuable know-how and practical experience.

Comment: Comparing workforces enables us to assess the potential of future endeavours on both the research and commercialization side. Kyulux has a much larger and more experienced team and much more research resources. Even though Kyulux team's academic contributions are significantly greater, NCL's has managed to establish partnerships with researchers from world's leading research centres such as: Karlsruhe Institute of Technology, ITRI, and Fraunhofer IAP, to bridge the research gap. Nevertheless, both companies differ quite significantly in this regard.

Products

Kyulux: The Japanese company is a pioneer in TADF technology and has one of the best emitter systems currently available.

Noctiluca: NCL's management is of the opinion that its emitters are as good as those of its competitors or even better. The company wants to be the supplier of materials for the entire emission layer, which will consist of two hosts, a sensibiliser (TADF) and an MR-TADF emitter. In contrast to Kyulux, the company works in both PVD – which is the current market standard - and IJP technology.

Comment: Regarding technological advancement of materials, we do not observe significant differences when it comes to the next-gen products offered by both companies. Kyulux has struggled with developing an efficient deep-blue emitter, while Noctiluca, despite a later start, has closed the technological gap to Kyulux quite quickly. The key difference is that Kyulux is partly owned by Samsung and LG, and its organic materials are much closer to being used in the end device of these respective companies, thus covering the majority of the OLED materials market, especially in the largest submarkets (smartphones, TVs).

Commercialization

Kyulux: The Japanese company was the first in the world to start commercial shipping of TADF materials in 2020. In 2023, it achieved full-scale commercialization of green material systems and is supposed to achieve the same in 2024E for red and blue material systems. The firm expects to achieve full-scale mass production from 2025E.

Noctiluca: NCL reported the first commercial sales of own red and green emitters in 2023.

Comment: The commercialization process is where Noctiluca has made the largest progress in the last 2 years. Recently, NCL's management has conducted a business trip to South-East Asia, where the largest potential customer base is located. The firm has entered multiple Material Transfer Agreements with the world's largest display companies and is expected to work in a form of joint-development project with LG Display from late 2024E. On the other hand, Kyulux already established its base of business partners many years ago. The display market leaders LG and Samsung even invested in Kyulux in 2016. Currently, the Japanese company is leading

the race for commercialization of the highly demanded deep-blue next-gen OLED emitter (expected in 2025E), however is dependent on the two Korean giants.

Intellectual property

Kyulux: The firm has a unique IP portfolio thanks to being a spin-off from Kyushu University and having close ties with this university. In 2023, the company appeared in Kikkei Business's Top 40 patent value growth ranking.

Noctiluca: The Polish company currently has 2 patents applications, with at least 5 more expected to be filed in 2024E. NCT has developed over 1,200 chemical compounds out of which c. 30% are patented.

Comment: We would like to highlight that comparing the number of patents is a wrong approach, as one patent might carry the majority of the company's total IP value, while other might be without practical use in the industry and as a consequence worthless from the market perspective.

There are transactions in the OLED market between companies concerning solely IP. Noctiluca has a significantly lower number of patents than its competitors. NCL's management explained us that it is not a priority for them, but after observing the OLED transaction market we have concluded that patents are what carries value and therefore are important for valuing developers of OLED emitters. The effective value of a patent and the potential it provides for entering a joint development project is determined by the industry player. NCL's IP strategy is to carry out as many joint projects as possible with commercial partners in order to obtain joint IP, rather than filing a large number of patents. Thanks to this approach, NCL delays the filling of patents, but is able to save a lot of money and is closer to the final commercialisation of its innovations. Moreover, its competitors do not get access to its R&D results too early.

It is impossible for us to determine the true value of Noctiluca's patented chemical substances and this is yet to be determined by its industry partners. We have based our estimation on the willingness of major display manufactures to cooperate with Noctiluca. So far, Noctiluca has only patented its innovative chemical compounds, while Kyulux patents also cover various other aspects of OLED TADF technology.

Factor Valuation

Factor	Weight	% of Kyulux
Team	20%	25%
Products	20%	80%
Commercialization	10%	30%
Intellectual property	50%	20%
Weighted Average		34%

Source: East Value Research GmbH

Kyulux is currently valued at c. USD 275m. We have concluded that Noctiluca currently represents about 34% of Kyulux potential, which results in a valuation of USD 93.5m.

Valuation Summary

Type	Value	Weight
Market Leader Valuation	93.50	50%
Funding Valuation	70.00	50%
Fair Value (in USDm)	**81.75**	**100%**
PLN-USD	3.97	
Fair Value (in PLNm)	**324.92**	
No of shares	1.56	
Fair Value per share (in PLN)	**208.62**	

Source: East Value Research GmbH

Based on our methodology, which weights both methods by 50%, we derive a fair equity value of Noctiluca of PLN 324.92m, which implies a FV per share of PLN 208.62.

Latest results

Revenues and profitability

In the first four years since establishment, Noctiluca has focused on gaining market knowledge and how to commercialize an emitter and related materials. Despite this, till 2022, the company has managed to generate PLN 3.15m of revenues, the majority of which stemmed from conducting custom synthesis of non-proprietary emitters. The company's activity related to development of proprietary OLED emitters has only generated costs, mainly related to personnel.

in PLNm	9M/23	9M/22	change y-o-y
Net sales	**0.32**	**0.19**	*65.3%*
Net sales (incl. cl	**0.32**	**1.05**	*-69.7%*
EBITDA	**-3.07**	**-1.52**	*101.5%*
EBITDA margin	*-965.3%*	*-145.0%*	
EBIT	**-3.99**	**-1.83**	*117.6%*
EBIT margin	*-1255.6%*	*-174.7%*	
Net income	**-3.95**	**-1.87**	*111.1%*
Net margin	*-1243.2%*	*-178.3%*	

Source: Noctiluca S.A., East Value Research GmbH

In 9M/2023, the company generated revenues of only PLN 318k, which represents a decrease of 69.7% compared to the corresponding period in 2022. In our view, approximately 85-95% of the revenues came from the sale of materials, out of which 60-75% was generated by the company's own high-performance materials.

Unsurprisingly, operating expenses increased to PLN 5m (+56.9% y-o-y) due to the opening of a new laboratory and an increase in headcount by 15 full-time employees. Thereof, depreciation & amortization expenses went up by 196.7% y-o-y to PLN 922k, and salaries by 131% y-o-y to PLN 1.07m.

Balance sheet and Cash flow

At the end of September 2023, Noctiluca had equity of PLN 4.5m (73.5% ratio). Other large positions on the balance sheet were cash (PLN 3.3m), followed by intangible assets (PLN 1.26m) and fixed assets (PLN 948k). The value of intangible assets is derived from completed R&D activities, while fixed assets mainly relate to laboratory equipment. On the liabilities side, the largest item, PLN 1.3m, was the settlement of a grant.

In 9M/23, Noctiluca reported an operating cash flow of PLN -3.7m compared to PLN -2.3m in the previous year. This stemmed from a larger net loss y-o-y. Investing cash flow, which mainly reflects investments in laboratory equipment, equalled PLN -354k (9M/22: PLN -203k) and cash flow from financing – mainly reflects share issues - PLN 6.4m (9M/22 PLN -41k). In total, the company's cash position increased by PLN 2.4m since January 2023. At the end of 9M/23, Noctiluca had no interest-bearing debt.

Financial forecasts

Revenues and profitability

In this report, we have decided to only show forecasts in full-year 2023E and 2024E as those in the coming years are very uncertain.

in PLNm	Q1/22	Q2/22	Q3/22	Q4/22	*2022*	Q1/23	Q2/23	Q3/23	Q4/23E	*2023E*	*2024E*
Net sales	**0.30**	**0.14**	**0.61**	**-0.02**	***1.03***	**0.00**	**0.04**	**0.28**	**0.53**	***0.85***	***4.67***
y-o-y change	*n.a*	*n.a*	*n.a*	*n.a*	*83.3%*	*-99.7%*	*-72.5%*	*-54.4%*	*-3247.9%*	*-17.7%*	*449.4%*
EBITDA	**-0.42**	**-0.71**	**-0.39**	**-0.87**	***-2.39***	**-1.08**	**-1.23**	**-0.76**	**-0.31**	***-3.38***	***-2.08***
EBITDA margin	*-140.0%*	*-515.2%*	*-64.1%*	*5135.5%*	*-231.4%*	*-108000.0%*	*-3234.2%*	*-272.0%*	*-58.2%*	*-397.3%*	*-44.6%*
EBIT	**-0.52**	**-0.81**	**-0.50**	**-0.98**	***-2.81***	**-1.18**	**-1.57**	**-1.24**	**-0.79**	***-4.78***	***-3.99***
EBIT margin	*-173.3%*	*-587.7%*	*-82.2%*	*5783.4%*	*-272.1%*	*-118400.0%*	*-4134.2%*	*-442.7%*	*-147.7%*	*-561.9%*	*-85.4%*
Net income	**-0.53**	**-0.83**	**-0.52**	**-0.98**	***-2.85***	**-1.19**	**-1.55**	**-1.22**	**-0.77**	***-4.72***	***-3.95***
Net margin	*-176.0%*	*-600.0%*	*-84.3%*	*5810.1%*	*-276.2%*	*-118600.0%*	*-4078.9%*	*-435.5%*	*-145.1%*	*-555.6%*	*-84.6%*

Source: Noctiluca S.A., East Value Research GmbH

Revenue Source	Est. Annual revenue per contract (in USDm)	Est. Annual revenue per contract (in PLNm)	Quantity	Total in 2024E (PLNm)	Notes
Inuru	0.25	1.00	1.00	1.00	Sales of proprietary high performance materials
JDP contract (major)	0.80	3.20	0.25	0.80	Sales of proprietary high performance materials with LG Display
JDP contract (minor)	0.50	2.00	0.30	0.60	Sales of proprietary high performance materials with a Taiwanese company
MTA contract (major)	0.10	0.40	2.50	1.00	Sales of proprietary high performance materials for testing
MTA contract (minor)	0.05	0.20	1.50	0.30	
			Total from own material	**3.70**	
Custom Synthesis & cCRO				0.97	
			TOTAL REVENUES	**4.67**	

Source: Noctiluca S.A., East Value Research GmbH

In general, as a developer of advanced OLED high performance materials (incl. emitters), Noctiluca aims to capture a share of the market of US-based company Universal Display Corporation (Market cap USD 8.4bn), which is the market leader in 1st and 2nd generation OLED (Fluorescence- and Phosphorescence-based) and in 2022 generated USD 331m from sales of materials and USD 267m from royalties and licensing of IP.

In 2024E, the majority of revenues will come from sales of proprietary high-performance materials. The company has so far signed 5 MTAs (Material Transfer Agreements), which should generate USD 50k-100k of revenues per year each over 6-12 months. We expect the signing Joint Development Project (JDP) agreement with LG Display at the end of 2024E, which should result in revenues of up to USD 1m per year each for 1-1.5 years. The next (and final) stage of commercialisation – likely in 2 years at the earliest – will be a supplier contract, whereby Noctiluca will receive revenues based on the sales volume of the client's products that comprise its OLED emitters and other high-performance materials. This is the phase, when we expect its revenues to grow exponentially at a very high gross margin of >80%. Currently, Noctiluca has only one supplier contract with Inuru, which we estimate will generate revenues of PLN 1m in 2024E. We estimate other revenue sources, mainly sales of non-proprietary chemical materials, at PLN 0.97m, and total revenue for 2024E at PLN 4.67m.

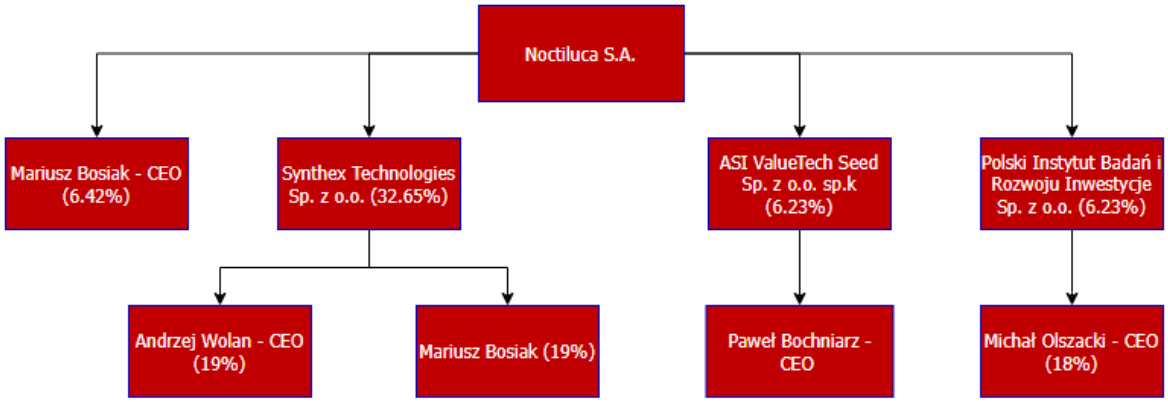
Liquidity & financing

With a monthly cash burn of c. PLN 410k and a cash balance of PLN 3.3m at the end of 9M/23, Noctiluca has sufficient funds at least until May 2024E. This period could be extended given Synthex Technologies' – its largest shareholder's - business line of credit. NCL's management has announced plans to raise further funds and move to the main (regulated) market of the Warsaw Stock Exchange in H1/24E. Noctiluca wants to raise between PLN 8m-15m in a round targeted mainly at institutional investors. If NCL is successful in raising funds, it will most likely be solvent until break-even, which management expects at the end of 2024E / beginning of 2025E.

Business description

Noctiluca S.A. (NCL) is a specialized deep-tech chemical company based in Torun/Poland that was founded in 2019 as a spin-off of Synthex Technologies Sp. z.o.o. Synthex provides synthesis services to the chemical, pharmaceutical and agrochemical industries. Noctiluca's core business activities are focused on discovering innovative chemical compounds (high performance materials), exhibiting TADF (Thermally Activated Delayed Fluorescence) properties. Emitters and other organic chemicals form an OLED diode that is a crucial component of OLED devices – displays (smartphones, wearables, VR devices, or TVs) and light sources (lamps). The company has been listed on the alternative stock exchange NewConnect since 2022 and currently has 21 employees (14 full-time, 7 freelancers). In addition, it co-operates with scientists in Taiwan and Germany as well as various advisors.

Shareholders structure



Source: Noctiluca S.A., East Value Research GmbH

The largest shareholder of Noctiluca is Synthex Technologies, an entity founded in 2012 and owned by Dr. Andrzej Wolan (Noctiluca's Supervisory Board member), Dr. Mariusz Bosiak (NCL's CEO), and advisory & investment firm Rubicon Partners. Other founding venture capital funds of NCL include ASI ValueTech Seed and Polski Instytut Badań i Rozwoju Inwestycje.

The founding VC funds have a strong impact on Noctiluca as they have personal power to appoint a member of the supervisory board, provided that they maintain a certain share of the share capital. Rubicon Partners is a venture builder that supports Noctiluca on a daily basis, helping NCL to raise capital and develop its business activities. All investment and financing decisions are made in consultation with Rubicon Partners.

Shares breakdown (Rounds)

Type	Total raised	Beneficiary	Date (agreement)	Note
Series A	Founding round	Andrzej Wolan, Mariusz Bosiak, Piotr Trzaska, Synthex Technologies	Q4/18	3 key employees (lock-up until 06/2024) and Synthex Technologies (no lock-up)
Series B	Founding round / PLN 1.3M	ASI ValueTech Seed, Polski Instytut Badań i Rozwoju Inwestycje	Q4/18	VC funds | Out of 1.3m, majority received in a form of a grant
Series C	Founding round/ undisclosed	R Ventures	Q4/18	VC fund (part of Rubicon Partners)
Series D	PLN 4.2m	Various investors including, JR Holding	Q4/20	Investment fund
Series E	PLN 6.7m	Rubicon Partners (75%) and undisclosed investor (25%)	Q4/20	Warrants converted into shares in 2023
Series F	N/A (Warrants)	Krzysztof Czaplicki, Mateusz Nowak, Alicja Zielińska, Sri Peruvrmba	Q4/20	COO, CCO, R&D specialist, advisor (Must be converted before 12/10/2025)
Series G	PLN 1.05m	Various investors (7)	Q2/21	pre-IPO
Series H	PLN 3.5m	Various investors (75)	Q3/21	pre-IPO

Source: Noctiluca S.A., East Value Research GmbH

Company history

2012: Foundation of Synthex Technologies Sp. z o.o.

2019: Foundation of Noctiluca S.A. in January.

Noctiluca develops its proprietary mathematical algorithm to optimize the process of OLED emitter discovery.

2020: Signing of two NDA's (Non-Disclosure Agreements) with commercial partners.

Sri Peruvemba – an expert in display technology with >25 years of experience - joins the Noctiluca team as an advisor.

Noctiluca is amongst five other companies (Cynora, Kyulux, Idemitsu, and Universal Display Corporation) to be recognized as a leading developer of TADF-based emitters.

Filing of the first patent application for a family of TADF compounds (several hundred proprietary emitters in total).

2021: The research team of Noctiluca discovers a new group of complex emitter structures with good TADF parameters. After synthesizing and testing these emitters, the company decides to file a second patent application for the best TADF emitters.

Signing of the first MTA (Material Transfer Agreement) contract with a Japanese company, a global automotive manufacturer and supplier of chemicals to most of the top 10 players in the display market.

Noctiluca starts cooperation with the Taiwanese agency ITRI, to which it supplies chemical substances (emitters) for external testing. The Industrial Technology Research Institute (ITRI) is a leading research organization dedicated to fostering technological innovation and industrial development through collaborative research. Through ITRI, Noctiluca cooperates with a Taiwanese OLED panel and lighting manufacturer (target markets: medical lighting, automotive) in a co-development form. In addition, ITRI builds and tests OLED panels using Noctiluca's emitters.

NCL opens its own R&D division in Seoul (South Korea) in collaboration with Kyung Hee University. The research team is headed by prof. Jang Hyuk Kwon, a former chief researcher at Samsung SDI, who has published over 100 publications and has over 50 patents.

NCL prepares a green emitter for the use as a light source and a TADF emitter used in printing technology, thus closing the technological gap between emitters used in PVD (vacuum) technology and IJP (printing).

2022: Signing of a MTA contract with LG Display, a world leader in OLED technology. With revenues of USD 20.2bn in 2022, in 2023 LG Display likely supplied 55m small-to-midsized OLED devices.

NCL becomes Inuru's first choice supplier for high performance materials for OLED. The Berlin-based company is a pioneer in OLED inkjet printing technology and has patented a solution that enables it to implement "smart light" on any surface e.g. Coca- Cola and medicine bottles and posters.

IPO on NewConnect (WSE).

Project launch for the world's largest watch manufacturer and designer from Switzerland. The aim of the project is to create an ink containing a proprietary OLED emitter, which will be used to create an OLED stack and display demonstrator for the business partner. The presentation of the demonstrator is expected in January 2024.

Start of cooperation with a Big Tech company from the US.

2023: Noctiluca files another patent application for its proprietary latest-generation OLED emitter.

Signing of a JDP (Joint Development Project) agreement with a Taiwanese OLED manufacturer for medical lighting and automotive applications.

Signing of an MTA contract with Juhua (China), a subsidiary of the TCL Technology Group Corporation, a leading consumer electronics manufacturer worldwide.

Noctiluca enters into a 12-month agreement, under which it will conduct research on behalf of Inkbit Corporation (USA). The agreement falls under the category of cCRO (chemical Contract Research Organization).

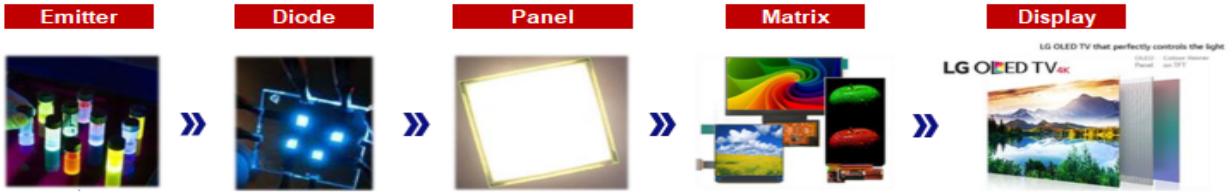
NCL opens a new laboratory in Torun.

Signing of a new MTA contract with the world's largest electronics manufacturer from the US. This is the continuation of the collaboration started in 2022 under the Non-Disclosure Agreement (NDA).

Signing of an MTA contract with a technology consulting company from the US. The collaboration includes the supply of test materials and the execution of dedicated research and development projects.

Delivery of a first batch of proprietary emitters to Inuru, which already uses them in its commercial products.

Components of an OLED display



Source: Noctiluca S.A., East Value Research GmbH

Each display consists of a matrix made up of very thin layers (stack) of panels. A panel is made up of diodes, which can be created using organic materials called emitters (chemical compounds in the form of powder) that emit light under the influence of an electric current. Emitters can be used as a light source or as part of a display. Their parameters influence the quality of the image displayed using OLED technology, the saturation of color, and the intensity of light.

Current state of OLED

Nowadays, OLED technology is progressively displacing LCD and LED technologies, capturing increasing market shares in the display and lighting industries. Compared to LCD/LED, the OLED technology has numerous advantages, such as design flexibility, energy efficiency, low heat emission, and vibrant colours. However, there are two main challenges that hinder its further development.

One of these challenges is the manufacturing process, which contributes to the high costs of OLED devices. There are two main technologies for manufacturing an OLED: ink-jet printing (IJP), and physical vapor deposition (PVD). Currently, the industry standard for OLED production is the PVD process, which is expensive as a PVD manufacturing factory costs around USD 1bn. While IJP is considered the best solution to make OLEDs more affordable, its adoption is gradual and still lags behind PVD technology, which remains the preferred choice. The inkjet printing technology allows for broader applications of OLED technology and is used e.g. by Inuru, for which Noctiluca is the main supplier of high-performance materials.

Secondly, the industry is currently using outdated 1st (blue/fluorescence) and 2nd (red and green/phosphorescence) generation emitters that are energy inefficient, have burn-in issues and limited lifetime. The problem with especially the blue OLED emitter is that it is four times less efficient at converting electricity into light than commonly used green and red emitters and needs to consume much more energy to generate comparable brightness level. So far, attempts to introduce more efficient 2nd generation blue emitters have failed because these high-energy materials degrade too quickly (sometimes within few hours).

The latest generations of OLEDs, based on Thermally Activated Delayed Fluorescence solve these issues. The TADF compounds were discovered around 2012 among others by Mr Adachi, a Japanese professor, who in 2015 founded Kyulux, which is the current market leader in the area of 3rd and 4th generation of TADF-based OLED emitters. Although red and green emitters are technologically ready for commercialisation, there is still a problem with the lifetime of the blue emitter. Noctiluca plans to solve this issue soon based e.g. on their 5th generation technology and wants to present an efficient and stable blue emitting display in the next two years.

Noctiluca's position in the OLED Market & its commercialisation strategy

In the case of Noctiluca, the area of focus is on the development of its own blue 3rd (TADF) and 4th (Hyper-fluorescence), and 5th generation emitters. The company's strategy is to develop emitters for both the ink jet printing (IJP), and physical vapor deposition (PVD) manufacturing processes.

In addition to supplying materials for the emissive layer (emitter, host, dopant), the company offers other materials for other OLED layers, i.e. transport layer materials (HTL, ETL), injection layer materials (HIL, EIL), blocking layer materials (HBL, EBL).

Commercializing an emitter and related materials is a multi-stage process. It can be broken down into five steps:

1. Mathematical modelling of the emitter's structure, chemical synthesis of emitter (internal process)
2. Testing and building an OLED diode (internal process)
3. OLED panel is tested by external partner (external process)
4. Step 2 and 3 is verified by OLED manufacturers (external process)
5. OLED panel is used in a mass-produced device (external process)

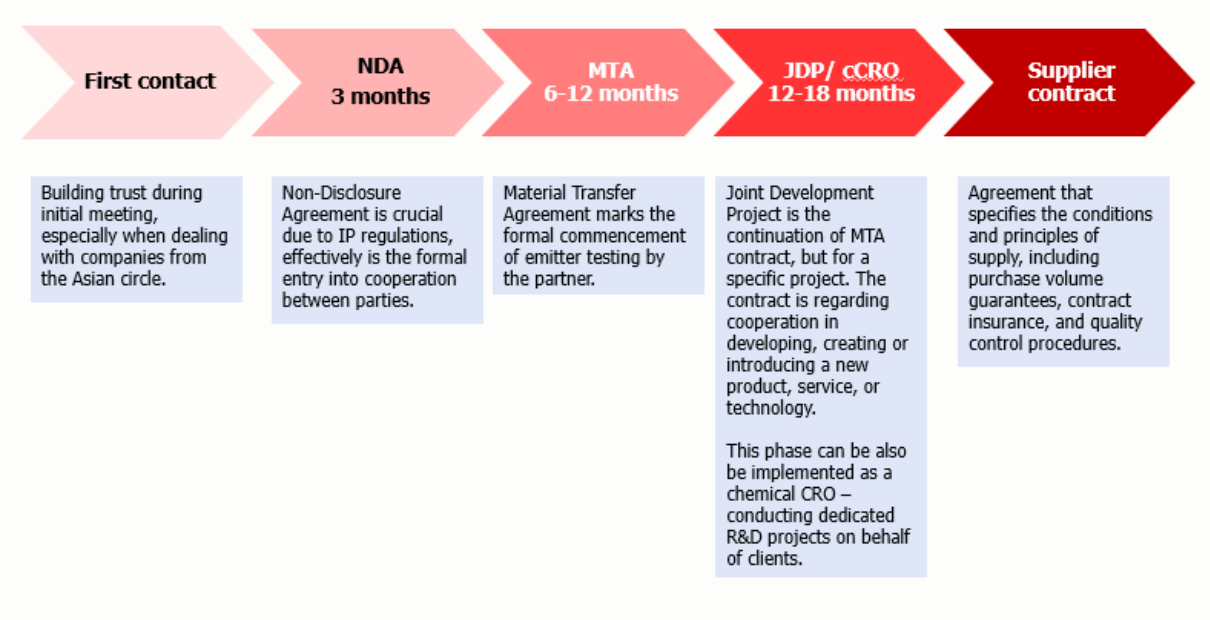
The first step is carried out internally in Noctiluca's laboratories in Torun, while the second one is conducted in Noctiluca's lab in Seoul. The third step is necessary to obtain a crucial document in the industry – a data sheet, on which potential commercial partners base their decisions. Although this step is not strictly mandatory, Noctiluca carries it out externally to increase credibility. The research partners at this stage are ITRI and Fraunhofer.

Step four refers to the need to verify the parameters of an emitter and other materials by the OLED panel manufacturer. New materials provided by Noctiluca must be adapted for specific use in the partner's devices. Material testing is carried out during the MTA contract, which typically lasts 6-12 months and is often preceded by a non-disclosure agreement (NDA). If the partner confirms that the materials have satisfactory parameters, the next step is to test materials in the partner's technological system. This verification of materials in OLED panels by business partners is an overly complex process over which the emitter supplier has little control. After the testing phase, there are two main paths of collaboration between Noctiluca and its industrial partners.

Research: In this path, Noctiluca – usually as a chemical CRO - focuses on the development of IP and conducting R&D for a certain partner. In many cases, this route does not lead to full commercialization, but rather to working with one or two major display manufacturers to meet their specific research needs. Cynora, a former competitor of Noctiluca, decided to follow this route with Samsung – the world's largest electronics manufacturer with a large R&D department - and was eventually acquired by the Korean electronics giant but only for the IP value as the company was liquidated shortly after the transaction.

Sales: As part of this path, both parties sign a Joint-Development Project (JDP) contract for the further development of an OLED device. During the implementation of this type of contract, a Proof of Concept (PoC) is conducted, a process that demonstrates that the particular technology works as intended and is ready to be implemented in a real-world scenario. After a successful PoC, there is a very high probability – NCL estimates it at 80% - that such a device will be produced on a mass scale and that the material company will become a direct supplier of emitters for that device. Co-development projects typically take about 1 to 1.5 years, while the entire commercialization process from the discovery of a new chemical compound in the laboratory takes from 2 to 4 years.

Commercialization phases



Source: Noctiluca S.A., East Value Research GmbH

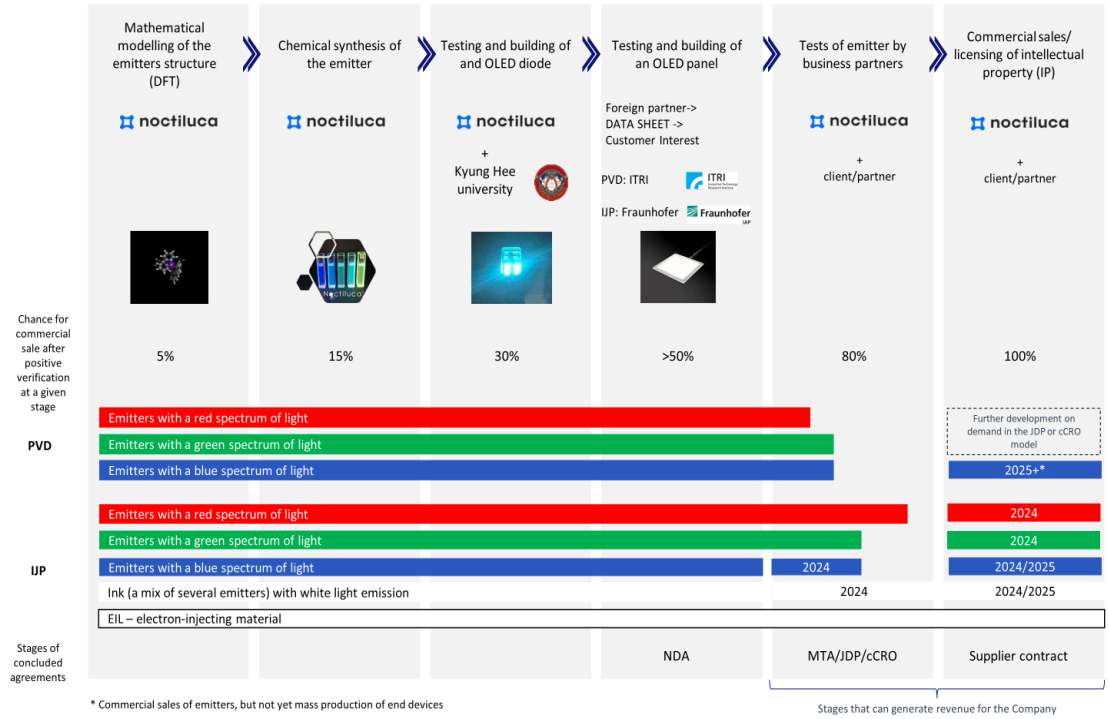
In our view, Noctiluca focuses on the Sales path, which explains the low number of patents compared to its direct competitors and the signing of co-operation agreements with as many OLED manufacturers as possible. In addition to revenues from the sale of materials, the company is working with partners in the OLED world to develop joint solutions that may result in the acquisition of joint IP, adding further value to the company.

Commercialization process of proprietary materials by producers

		Current Status	2024 1H	2024 2H	2025	Likelihood of JDP/cCro	Technology used	Possiblity of cooperating in cCRO model
1	Inuru	**Implementation in progress**				**100%**	IJP	Yes
2	LG Display	MTA		JDP		80%	PVD	No
3	Switzerland	NDA	JDP		Implementation	70%	IJP	Yes
4	USA	MTA		JDP		60%	PVD	No
5	Taiwan	JDP			Implementation	**100%**	PVD	Yes
6	Taiwan	MTA			JDP	50%	PVD	Yes
7	Juhua (TCL & Tianma)	MTA		JDP		40%	PVD/IJP	Yes
8	"Global producer"	NDA/MTA		JDP		60%	PVD	No
9	USA			NDA	MTA	30%	PVD	Yes
10	USA	NDA	MTA		JDP	30%	PVD	Yes
11	China	NDA		JDP		50%	PVD/IJP	Yes
12	France		NDA	MTA		30%	PVD	Yes
13	Taiwan		NDA/MTA		JDP	40%	PVD	Yes
14	USA		NDA	MTA		20%	PVD	Yes
15	China		MTA	JDP		50%	PVD	Yes

Source: Noctiluca S.A., East Value Research GmbH

Commercialization process of materials by product type



Source: Noctiluca S.A., East Value Research GmbH

In 2024E, Noctiluca' emitters are expected to be implemented in monochromatic displays used for marketing, signage and advertising purposes of its partner Inuru on a much larger scale than before. According to management, next on the commercialization timeline will be the implementation of monochromatic OLED panels in wearables, indoor & outdoor lighting fixtures, automotive, and medical lighting applications. By 2027E, management expects that NCL's emitters will be included in multichromatic OLED displays.

The business model of Noctiluca is significantly different from that of its competitors ex. Cynora (past) or Kyulux, which work exclusively with a few key players in the display industry. The Polish company believes that diversification is necessary to avoid vendor lock and to make OLED affordable.

Observing the financial struggles of CYNORA, which led to the acquisition and technology delays of Kyulux, we believe that the current strategy - focusing on the commercialisation of emitters and working on a tight budget - seems right. The mass production of OLED devices using TADF-based emitters is not clearly defined, and companies should gradually increase their R&D activities and actively respond to the signals of OLED panel manufacturers.

Management

Management Board

Dr Mariusz Bosiak (CEO, CTO): Mr. Bosiak is the co-founder of Noctiluca, where he currently serves as CEO and CTO. With a Ph.D. in chemistry specializing in optoelectronics and 15 years of experience, he is an assistant professor at Nicolaus Copernicus University in Torun. Dr Bosiak is an expert in implementing research projects. Currently, he holds two patents in the Polish Patent Office and has co-authored over 10 scientific publications in organic chemistry. Additionally, he is the founder and partner of Noctiluca's largest shareholder, Synthex Technologies sp. z o.o., and serves there as a member of the supervisory board.

Krzysztof Czaplicki (Member, COO): Mr. Czaplicki is an experienced entrepreneur and manager and has been involved in numerous startup initiatives in the past. Mr. Czaplicki has extensive experience in managing seed and venture capital investment funds. He is a venture partner at Rubicon Partners. His specialization lies in strategic management, including developing and implementing company strategies, building value, planning and improving processes, and designing and implementing business models. He graduated from the University of Warmia and Mazury with a degree in biotechnology.

Supervisory Board

Wojciech Ratymirski (Head): Mr. Ratymirski has been a member of the supervisory board since January 2019. He is the managing partner of ASI ValueTech Seed**,** a VC fund with a 6.23% stake in Noctiluca. ValueTech Seed was the company's founding member. Throughout his professional career, Mr Ratymirski has actively participated in capital transactions, both on the sell and buy side. He has successfully executed several investments, achieving high rates of return for the investors. Mr Wojciech Ratymirski holds degrees in Law and Political Science from the University of Wrocław.

Paweł Bochniarz (Member): Mr. Bochniarz has been associated with Noctiluca since November 2021 as a member of the supervisory board. Paweł Bochniarz is the CEO of ASI ValueTech Seed, a VC fund investing in advanced technology startups. He also serves as the chairman of MIT Enterprise Forum CEE, one of the largest acceleration programs in Central and Eastern Europe that is focused on deep tech startups. Mr. Bochniarz graduated from the University of Warsaw with a degree in economics and completed postgraduate studies – the advanced management program at IESE Business School.

Dr Andrzej Wolan (Member): Mr. Wolan is a scientist with extensive experience in the field of organic chemistry and is one of the founders of Noctiluca. He is an assistant professor at Nicolaus Copernicus University in Torun. In addition to his academic role, Dr. Wolan has over 15 years of experience in providing commercial synthesis services for leading companies in the chemical, agrochemical, and pharmaceutical sectors. He founded Synthex Technologies, the parent company of Noctiluca. He also co-founded Fresh-Inset, an agritech start-up that with its technology allows for the extension of the freshness of fruits and vegetables and is currently serving as its CEO.

Michał Olszacki (Member): Mr. Olszacki is the co-founder and CEO of PIBIR (Polish Institute of Research and Development), a VC fund funded by the EU, which currently holds a 6.23% stake in Noctiluca. He has been associated with the firm since the beginning as a supervisory board member. From 2011 to 2016, he worked as a project manager and researcher at the National Centre for Nuclear Research. Mr. Olszacki holds a doctorate from the Institute National des Sciences Appliquees de Toulouse. He specializes in the commercialization of science.

Marek Kotelnicki (Member): Mr. Kotelnicki has been related to the company since September 2022. He is the managing partner of VIGO Ventures, a VC fund focusing on early-stage investments in photonics and semiconductor companies across Europe. Mr. Kotelnicki is a business development consultant for deep-tech companies, including Noctiluca. In the past, he has provided advisory services to hundreds of technology firms from over 40 countries in the areas of technology commercialization, capital raises, and business development.

Noctiluca's senior staff & advisors

Prof Jang Hyuk Kwon: Mr. Kwon is a professor at Kyung Hee University, specializing in material science. With over 300 research papers and over 5,000 citations resulting in a h-index of 38, he is one of the world's leading scientists in his respective field. The former chief researcher at Samsung SDI, who now heads Noctiluca's research division in Korea, is testing Noctiluca's high-performance materials in his own devices, marking the final step in internal commercialisation.

Dr Chang-Kwan Kim: Dr Kim is a seasoned OLED technology researcher, manager and business driver with over 20 years of experience in the display field. Early work at KAIST, Iowa State University, US DOE AmesLab was followed by 12 years at various positions at LG Chem and recently led to CTO/COO roles at Selcos and DisFlex. With over 50 patent mentions and servicing top-tier clients all over Korea, China, Taiwan and Japan is regarded as a technical and materials sales powerhouse in the region. Holds a position of Noctiluca's official business partner and agent in Korea.

Sri Peruvemba: Mr. Peruvemba is the CEO of Marketer International, a marketing company that brings together experienced professionals to help companies with complex projects such as global market expansion plans. With over 25 years of experience in the display industry, he joined Noctiluca in 2020 to facilitate Noctiluca's global expansion, promote Noctiluca's products in the US and act as an advisor to management. In 2022, he received an award from the Society for Information Display for outstanding lifetime achievement in the display industry, where he also serves as chairman of marketing.

Market environment

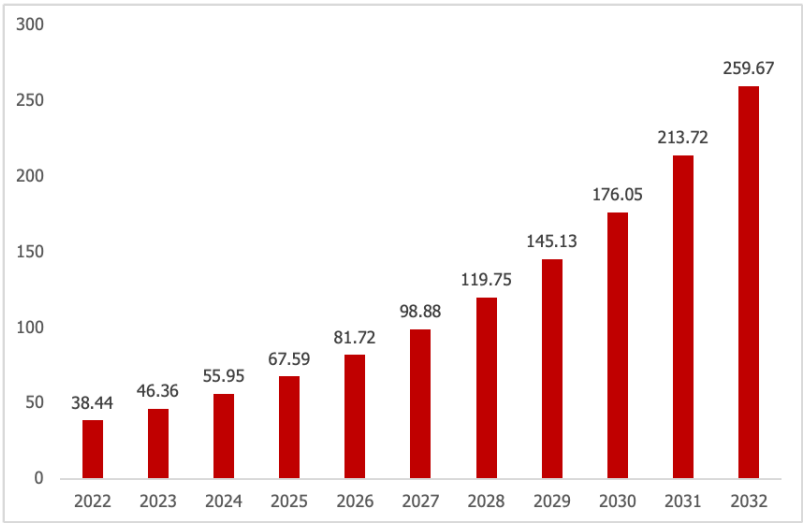
Market potential of OLED technology

To understand the potential of Noctiluca's products, it is important to determine where OLED technology can be used. Noctiluca specializes in chemical compounds known as emitters and other chemical high-performance materials for OLED. Emitters are essential materials for the construction of OLED (Organic Light Emitting Diode) panels, which are used in various industries, mainly display, and lighting. The main players in these markets are Samsung, Apple, Lumiotec, OSRAM, Merck, BOE, LG, Panasonic, with many of which Noctiluca has already established formal business relationships.

According to various market research reports, the display market was valued at a range of USD 125-160bn in 2022 and expected to reach a range of USD 220-315bn market value in 2032E, representing a CAGR of 3.5% to 7% over this period. Manufacturers of TVs, smartphones or wearable electronics seek more flexible and energy-saving materials that only OLED technology can offer.

As of 2022 the lighting market has been valued at USD 122bn and is expected to grow at a CAGR of 4.4% to USD 169bn in 2030E (source: Fortune Business Insights). From an OLED technology point of view, the share of OLED technology in this market is relatively low due to the high costs of OLEDs compared to LEDs. In the future, advances that make OLED more affordable would open significant growth opportunities for material companies in the lighting industry.

Global OLED market (in USD bn)



Source: Precedence Research, East Value Research GmbH

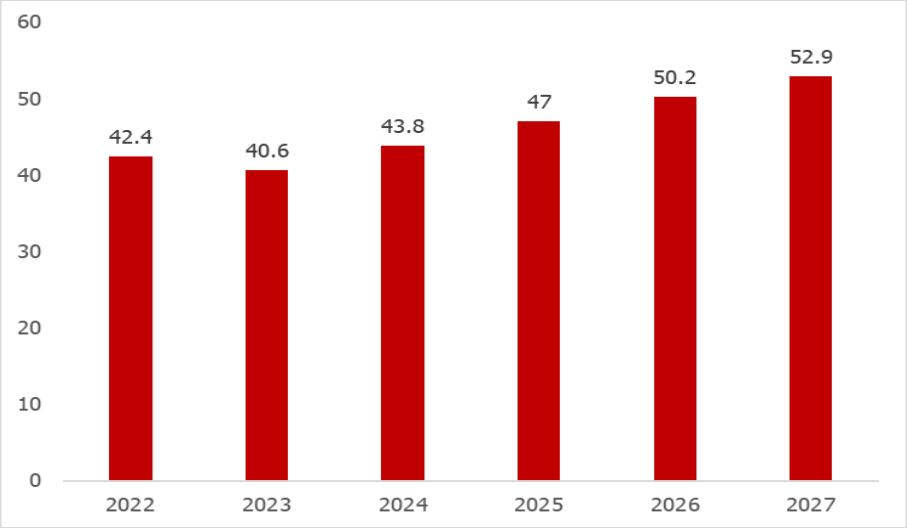
Nowadays, most of the displays and lighting are still using LCD/LED technology, but manufacturers are gradually moving to use OLED technology, a segment where Noctiluca operates. We observe a strong push for OLED technology from the display market leaders.

According to Precedence Research, the global OLED market was valued at USD 38.44bn in 2022 and is expected to reach USD 259bn by 2032E, with a CAGR of 21%. The display industry (82%) and the consumer electronics segment (31%) accounted for the largest shares in 2022. For comparison: The LCD market, which can be regarded as a reference for OLED, is currently worth around USD 100bn.

OLED is clearly the technology of choice for displays, with more than USD 38bn invested by the largest display manufacturers in recent years. For example, in 2020 TCL started building a new inkjet OLED factory for USD 6.8bn.

What makes OLEDs so attractive is that they can be used in so many different ways. OLED diodes can be used as a display in a car or as part of a military helmet, among others. For example, according to DSCC (Display Supply Chain Consultants), the automotive display segment is expected to grow from over 200m panels in 2023 and around 450m in 2027E. On the other hand, the US Army has recently replaced an LCD microdisplay with an OLED one in the F-35 helmet-mounted display systems.

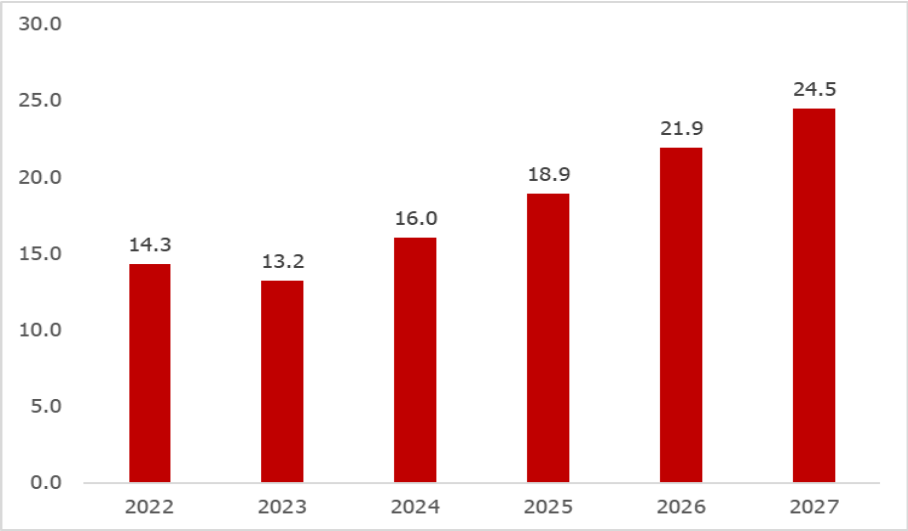
OLED display market (revenues in USD bn)



Source: Omdia OLED Display Market Tracker, East Value Research GmbH

According to market research firm OMDIA, the demand for OLED displays will grow at a CAGR of 11% from 2022 to 2030E. The key growth driver for this market is the increasing share of OLED in the global display market, due to the improving performance of OLED displays. The smartphone market is the largest contributor to the current market value. In 2023, OLED displays in smartphones reached an adoption rate of around 50%, doubling in just 5 years (source: Counterpoint Research). In the TV industry, LCD/LED TVs are gradually being replaced by OLED TVs.

OLED display panel demand (square meters in millions)

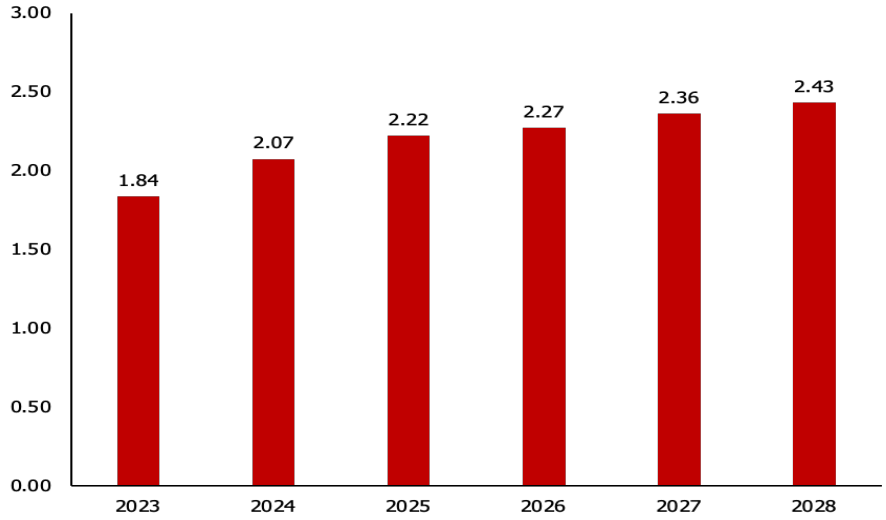


Source: Omdia OLED Display Market Tracker, East Value Research GmbH

From the perspective of an OLED material company, the panel area is more important. As presented in the graph above, the demand for panels decreased in 2023 due to market uncertainties but is expected to increase from then on. The majority (c. 90%) of demand comes from mobile and TV devices, with an increasing share of TVs in the near future (source: Omdia). To maximize profits, a material supplier such as Noctiluca should focus on developing business relationships with TV OLED panel manufacturers.

The market for OLED materials

Total sales forecast of OLED emitting materials (2023-2028E)



Source: UBI Research, East Value Research GmbH

Analysts at DSCC value the OLED material market at USD 1.4bn in 2023 and expect it to reach USD 2.18bn by 2027E (CAGR = 12%). According to UBI Research, a Korean research company, the market is expected to reach USD 1.8bn in 2023 to USD 2.43bn by 2028E (CAGR = 5.8%).

Beyond these estimates, we believe the total market value will be much higher if an efficient blue OLED emitter is discovered. Due to the unpredictability of such an event, it is difficult to estimate the true impact of these discoveries, but it could likely add hundreds of millions to the total market value.

The OLED materials market is not very populated as the development of such advanced materials is costly and takes years to commercialize, which can deter potential investors. At present, the market is dominated by Universal Display Corporation, which supplies the largest OLED players with old generation materials.

As Noctiluca creates a new generation of OLED materials, we are focusing on innovative companies that want to transform the market by developing innovative TADF-based materials that are not currently used by OLED manufacturers for mass production. Kyulux, the market leader in TADF-based OLED materials, is targeting an IPO on the NASDAQ in 2025E, an event that will be particularly important in terms of how professional investors value this emerging market.

The companies in this market can be divided into two groups: start-ups/small companies and large corporations in the display industry. The first group includes the aforementioned in this report: Noctiluca, Kyulux, Credoxys, and beeOLED. These companies are solely focused on developing innovative materials for the OLED industry.

New materials for the production of OLED devices are particularly sought after by the display industry. This is reflected in the high funding rounds of respective startups. The most recent financing round took place at the end of 2023, when Kyulux raised around USD 28.6m from various investment funds, bringing the total raised since inception to over USD 100m. Credoxys, a German start-up founded in 2021, secured a funding round in November last year. As for beeOLED, a German start-up founded in 2020, the company raised over EUR 13m in Series A funding in August 2023. These funding rounds are quite interesting due to the fact that the founders of Credoxys and beeOLED are former employees of Novaled, a company that had been acquired by Samsung. Although Novaled did not specialize in own proprietary materials, but conducted research related to high-performance materials, former employees, seeing the potential of next-generation materials, decided to start their own companies. Moreover, Credoxys and beeOLED are even located in the same city of Dresden, Germany.

The second group is made of display manufacturers' own R&D teams that can produce materials, often formed through the acquisition of companies from the first group. In the past, Samsung has acquired companies that developed OLED materials, namely Novaled (for USD 347m in 2013), Cynora (for USD 300m in 2022), and most recently the US-based leading producer of OLED microdisplays eMagin for USD 218m. Novaled raised a total of USD 36m, while Cynora raised a total of c. USD 63.6m. In both cases, LG and Samsung were present in previous funding rounds.

A signal for the market was the acquisition of Cynora just to obtain its IP and eventually liquidate the company. Nevertheless, such deals to acquire IP rights are common in the OLED world. For example, Universal Display Corporation bought the entire OLED IP portfolio of BASF in 2012 for USD 105m and in 2016 for USD 96m.

Profit and loss statement

in PLNm	2019	2020	2021	2022	2023E	2024E
Total revenues	**0.88**	**0.67**	**0.56**	**1.03**	**0.85**	**4.67**
CoGS	-1.13	-2.00	-2.76	-3.53	-4.33	-6.33
Gross profit	**-0.25**	**-1.33**	**-2.19**	**-2.50**	**-3.48**	**-1.66**
Other operating income	0.16	0.03	0.34	0.41	0.91	0.80
Administrative expenses	-0.02	-0.03	-0.17	-0.29	-0.79	-1.21
Other operating expenses	0.00	0.00	0.00	-0.01	-0.02	-0.02
EBITDA	**-0.12**	**-1.33**	**-2.03**	**-2.39**	**-3.38**	**-2.08**
Depreciation & amortization	-0.01	-0.02	-0.31	-0.42	-1.40	-1.90
EBIT	**-0.13**	**-1.35**	**-2.34**	**-2.81**	**-4.78**	**-3.99**
Net financial results	0.00	-0.05	-0.03	-0.04	0.05	0.04
EBT	**-0.13**	**-1.40**	**-2.37**	**-2.85**	**-4.72**	**-3.95**
Income taxes	0.00	0.00	0.00	0.00	0.00	0.00
Minority interests	0.00	0.00	0.00	0.00	0.00	0.00
Net income / loss	**-0.13**	**-1.40**	**-2.37**	**-2.85**	**-4.72**	**-3.95**
EPS	-0.08	-0.90	-1.52	-1.83	-3.03	-2.41
DPS	0.00	0.00	0.00	0.00	0.00	0.00
Share in total sales						
Total revenues	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %
CoGS	-129.04 %	-296.74 %	-489.19 %	-341.73 %	-508.90 %	-135.54 %
Gross profit	-29.04 %	-196.74 %	-389.19 %	-241.73 %	-408.90 %	-35.54 %
Other operating income	17.81 %	3.86 %	60.40 %	39.61 %	106.62 %	17.15 %
Administrative expenses	-1.95 %	-3.77 %	-30.39 %	-28.17 %	-92.70 %	-25.88 %
Other operating expenses	0.00 %	-0.07 %	-0.12 %	-1.14 %	-2.36 %	-0.34 %
EBITDA	-13.18 %	-196.72 %	-359.30 %	-231.43 %	-397.34 %	-44.61 %
Depreciation & amortization	-1.56 %	-3.66 %	-55.51 %	-40.70 %	-164.52 %	-40.77 %
EBIT	-14.74 %	-200.39 %	-414.81 %	-272.13 %	-561.86 %	-85.38 %
Net financial results	-0.07 %	-6.69 %	-5.57 %	-4.11 %	6.22 %	0.75 %
EBT	-14.81 %	-207.07 %	-420.38 %	-276.25 %	-555.64 %	-84.63 %
Income taxes	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %
Minority interests	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %
Net income / loss	-14.81 %	-207.07 %	-420.38 %	-276.25 %	-555.64 %	-84.63 %

Balance sheet

in PLNm	2019	2020	2021	2022	2023E	2024E
Cash and cash equivalents	0.22	3.34	4.08	0.91	2.25	6.49
Other financial assets	0.00	0.00	0.00	0.00	0.00	0.00
Inventories	0.00	0.05	0.00	0.00	0.00	0.10
Trade accounts and notes receivables	0.06	0.84	0.10	0.16	0.66	0.99
Purchased receivables at amortised costs	0.00	0.00	0.00	0.00	0.00	0.00
Other current assets	0.87	0.02	0.58	1.42	0.00	0.00
Assets-held-for-sales	0.00	0.00	0.00	0.00	0.00	0.00
Current assets	**1.16**	**4.25**	**4.76**	**2.49**	**2.90**	**7.58**
Property, plant and equipment	0.00	0.00	0.87	0.71	0.96	1.20
Other intangible assets	0.08	0.96	0.79	0.59	1.41	2.23
Goodwill	0.00	0.00	0.00	0.00	0.00	0.00
Investments at-equity	0.00	0.00	0.00	0.00	0.00	0.00
Other investments	0.00	0.00	0.00	0.00	0.00	0.00
Deferred tax assets	0.00	0.00	0.00	0.00	0.00	0.00
Non-current assets	**0.08**	**0.96**	**1.66**	**1.30**	**2.37**	**3.43**
Total assets	**1.23**	**5.22**	**6.42**	**3.79**	**5.27**	**11.02**
Trade payables	0.11	0.99	0.15	0.19	0.31	0.33
Short-term financial debt	0.18	0.80	0.01	0.00	0.00	0.00
Other liabilities	0.01	0.14	0.29	0.34	0.27	0.21
Provisions	0.00	0.00	0.00	0.00	0.00	0.00
Current liabilities	**0.30**	**1.93**	**0.45**	**0.53**	**0.58**	**0.54**
Long-term financial debt	0.00	0.00	0.00	0.00	0.00	0.00
Other long-term liabilities	0.68	0.54	1.13	1.28	1.00	0.71
Provisions	0.00	0.00	0.00	0.00	0.00	0.00
Deferred tax liabilities	0.00	0.00	0.00	0.00	0.00	0.00
Long-term liabilities	**0.68**	**0.54**	**1.13**	**1.28**	**1.00**	**0.71**
Total liabilities	**0.98**	**2.47**	**1.59**	**1.81**	**1.57**	**1.26**
Shareholders equity	**0.25**	**2.74**	**4.83**	**1.98**	**3.70**	**9.76**
Minority interests	0.00	0.00	0.00	0.00	0.00	0.00
Total liabilities and equity	**1.23**	**5.22**	**6.42**	**3.79**	**5.27**	**11.02**

Cash Flow Statement

in PLNm	2019	2020	2021	2022	2023E	2024E
Net income / loss	-0.13	-1.40	-2.37	-2.85	-4.72	-3.95
Depreciation & amortization	0.01	0.02	0.31	0.42	1.40	1.90
Change of working capital	-0.14	0.00	-0.81	-0.67	-0.74	-0.64
Others	0.00	0.04	-0.03	0.04	-0.04	0.00
Net operating cash flow	**-0.25**	**-1.33**	**-2.89**	**-3.06**	**-4.11**	**-2.69**
Cash flow from investing	**-0.09**	**-0.01**	**-0.08**	**-0.05**	**-0.98**	**-3.04**
Free cash flow	-0.35	-1.33	-2.97	-3.11	-5.09	-5.73
Cash flow from financing	**0.56**	**4.46**	**3.70**	**-0.05**	**6.42**	**9.98**
Change of cash	0.22	3.13	0.73	-3.16	1.33	4.25
Cash at the beginning of the period	0.00	0.22	3.34	4.08	0.91	2.25
Cash at the end of the period	0.22	3.34	4.08	0.91	2.25	6.49

Financial ratios

Fiscal year	2019	2020	2021	2022	2023E	2024E
Profitability and balance sheet quality						
Gross margin	-29.04%	-196.74%	-389.19%	-241.73%	-408.90%	-35.54%
EBITDA margin	-13.18%	-196.72%	-359.30%	-231.43%	-397.34%	-44.61%
EBIT margin	-14.74%	-200.39%	-414.81%	-272.13%	-561.86%	-85.38%
Net margin	-14.81%	-207.07%	-420.38%	-276.25%	-555.64%	-84.63%
Return on equity (ROE)	-51.16%	-50.89%	-49.09%	-144.05%	-127.69%	-40.50%
Return on assets (ROA)	-10.52%	-26.78%	-36.96%	-75.33%	-89.60%	-35.87%
Return on capital employed (ROCE)	-13.81%	-39.48%	-37.58%	-79.51%	-97.22%	-37.51%
Economic Value Added (in PLNm)	-0.26	-1.81	-3.18	-3.29	-5.44	-5.42
Net debt (in PLNm)	-0.04	-2.55	-4.06	-0.91	-2.25	-6.49
Net gearing	-14.82%	-92.85%	-84.05%	-45.90%	-60.72%	-66.55%
Equity ratio	20.57%	52.62%	75.30%	52.29%	70.17%	88.57%
Current ratio	3.88	2.37	25.22	9.85	8.10	19.58
Quick ratio	0.95	2.33	22.15	4.24	8.10	19.32
Net interest cover	-215.33	-29.97	-74.57	-66.20	90.37	113.93
Net debt/EBITDA	0.33	1.92	2.00	0.38	0.66	3.12
Tangible BVPS	0.11	1.14	2.60	0.90	1.47	4.83
Capex/Sales	-10.43%	-0.95%	-13.30%	-19.60%	-122.06%	-65.17%
Working capital/Sales	97.81%	364.52%	810.47%	216.82%	299.52%	154.07%
Cash Conversion Cycle (in days)	-69	135	38	30	253	61
Trading multiples						
EV/Sales	n.a	n.a	n.a	177.42	215.64	39.25
EV/EBITDA	n.a	n.a	n.a	-76.66	-54.27	-87.98
EV/EBIT	n.a	n.a	n.a	-65.20	-38.38	-45.97
P/Tangible BVPS	n.a	n.a	n.a	133.8x	81.5x	24.8x
P/E	n.a	n.a	n.a	-65.4x	-39.5x	-49.6x
P/FCF	n.a	n.a	n.a	-59.9x	-36.7x	-32.5x

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