Key Facts:

Ticker-Exchange	MMAT-CSE
Closing Price	$5.63
Date of Report	June 11, 2021
Company Website	metamaterial.com
Analyst	MacMurray D. Whale, Ph.D., P.Eng. mwhale@cormark.com (416) 943-6708

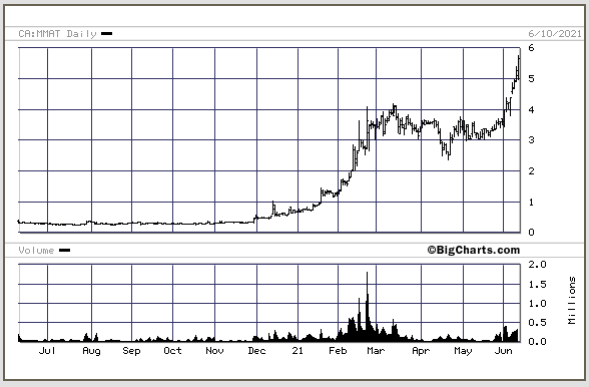
Company Statistics:

52-week High	$5.63
52-week Low	$0.24
Market Cap	$591.4 MM
Shares Outstanding	
- Basic	105.6 MM
- Diluted	114.1 MM
Cash	$13.4 MM
Debt	$4.9 MM
Pro forma RTO with TRCH-Nasdaq, shares will go to 530 MM and cash to US$27 MM.	
2020 Revenue	$1.5 MM
2020 Loss from operations	$9.8 MM

Major Shareholders:

Lamda Guard Tech./Palikaras (George)	14.8%
Welch (Tom)	11.2%
Innovacorp.	9.5%
Caldwell IM	3.2%

Price Chart:



Source: BigCharts.com, June 10, 2021

Our **Emerging Ideas** publication seeks to highlight firms that we come across during our travels where, while perhaps not ready for formal research coverage, we see notable developments or inflection points that we believe may be of interest to investors.

Nanostructures At Scale - Bringing The 'Meta' To Materials

Unless otherwise noted, all figures in C$

Corporate Overview:

Metamaterial Inc. designs and manufactures materials capable of manipulating light and other forms of energy, at such small scale and with such precision that its materials exhibit properties that are not found in nature. Furthermore, MMAT has harnessed these properties to create products from these new classes of materials capable of disrupting a number of markets – on both price and performance.

MMAT has developed an extensive portfolio of IP for both the design and the production of these materials into transparent films for a myriad of applications from enhancement of 5G coverage and deployment of augmented reality in eyewear to solar energy absorption films, automotive de-icing products and medical devices such as glucometers and image enhancement.

A key element to commercializing these materials is the ability to produce large amounts of this material at high throughput, within tight tolerances, and at low costs. ***What sets Metamaterial apart is that not only is it capable of designing specific properties into its materials, but it has pioneered a roll-to-roll technology capability for producing large amounts of the materials that is currently being ramped up at its facility in Dartmouth NS.***

Advances in artificial intelligence and data-driven analytics are disrupting the material discovery process, reducing what took a decade and tens of millions of dollars of R&D to just days at a fraction of the cost. The capability to design Metamaterial's films to demanding customer specifications quickly and accurately, along with the ability to produce at scale, means that MMAT is on the cusp of growing its revenues along with the introduction of its customers products. While the market is at an early stage of development, we estimate the total addressable market is in the US$50-US$80 B range.

Headquartered in Dartmouth, MMAT also has offices in the US, the UK, Japan and Switzerland.

Highlights And Catalysts:

- IP spanning holography, lithography and wireless sensing technologies
- Exposure to fast growing segments of 5G/automotive/augmented reality/solar energy industries with a TAM of US$50; Medical imaging/sensing industry brings another US$30 B in TAM
- Customer/partner relationships with major industrial players, including Airbus, Samsung, PPG, Denso, Lockheed Martin, Boeing and others
- Early-stage collaboration arrangements with Covestro for holographic films, and product samples of its NanoWeb products are under evaluation by customers in Japan, Israel, the US, South Korea, China and Germany.
- Completion of RTO with Torchlight this month will bring US listing and US$26 MM in cash
- Burn rate less than $6 MM annually

MacMurray D. Whale, Ph.D., P.Eng.(416) 943-6708,
mwhale@cormark.com

Notable Recent Developments:

- **Collaborates With Sage Geosystems on ARPA-E Proposal – April 2021:** The proposal aims to evaluate MMAT's NanoWeb technology for thermo-electric generator systems. Applications to be examined include energy recovery from geothermal well bores.
- **Obtains Final Order For Plan of Arrangement – March 2021:** The Ontario Superior Court of Justice approved the previously announced plan of arrangement with Torchlight Energy Resources (TRCH-Nasdaq). Arrangement is expected to close this month.
- **Signs 10-year Lease Agreement To Expand Operations – March 2021:** MMAT is expanding its facility in Dartmouth by 15,000 sq. ft to 68,000 sq. ft to allow for an addition to its holography and lithography R&D labs and next phase of its roll-to-roll process manufacturing.
- **Collaboration With Seksui To Improve 5G/6G Infrastructure – March 2021:** Together, MMAT and Sekisui are developing a new transparent and flexible radio wave reflection film, which passively reflects and transmits radio waves in the sub 6 GHz and millimeter wave ranges. The aim is to improve the performance and coverage of 5G and 6G networks.
- **Acquires Assets And IP From Swiss Lens Maker – February 2021:** MMAT acquired lens casting production equipment and IP from Interglass Technology AG, expanding its capabilities in design, development, and manufacturing of products for smart eyewear.
- **Installs First C-Wave Tunable Laser – December 2020:** The technology covers a gap in the colour spectrum for holographic systems.
- **Deepens Relationship With Covestro – November 2020:** MMAT signed a three-year supply deal with Covestro Deutschland AG for access to new photo-sensitive holographic film materials. Target markets include photonics/optical filters and holographic optical elements, diffusers, laser eye protection, optical combiners, and augmented reality applications.
- **Provides Gas/Dive Mask Prototypes to US Military – October 2020:** MMAT designed, produced, and tested fully submersible prototypes integrating NanoWeb® transparent conductive film for active defogging of the visors of dive masks and gas masks used by military personnel.

Metamaterials – Functionality From Patterning At The Nanoscale

Since its incorporation in 2011, Metamaterial Inc. has focused on designing and producing nanocomposite transparent materials that have specific properties not naturally found in nature. These properties are related to the manipulation of light by its enhancement, absorption or blocking of its transmission. This is nothing short of a revolution that has brought impressive ease and scale to designing whole classes of new materials, which have significant promise for new medical treatments, more efficient capture of solar energy, a higher level of environmental protection and enhanced national security capabilities.

These materials are engineered and constructed around basic nanostructure building blocks, analogous to how natural materials are built up from atoms or crystals. Like these natural materials, metamaterials derive their properties from the type, shape, and orientation of the nanostructures as well as their spacing and arrangement.

The ability to explore various permutations of these factors is allowing for enhanced behaviours and special characteristics. For example, patterned metallic mirrors can become transparent and yet effectively conduct electricity, giving rise to new transparent electrode designs for solar cells and displays. Nanostructured semiconductor layers allow creation of flat optical lenses for smartphones, projection optics for augmented and virtual reality displays, and light trapping layers for solar cells.

MacMurray D. Whale, Ph.D., P.Eng.(416) 943-6708,
mwhale@cormark.com

With all this promise, however, there are bottlenecks. To create such materials at scale, not only do the nanoparticles need to be made, methods to arrange them with extreme precision over large areas and at low cost is also necessary. MMAT has made progress in both areas.

The work in this area by MMAT has led to the creation of a portfolio of IP that the company is commercializing into products. As we will discuss below, the performance and price point of these products have a significant potential to disrupt a number of market verticals.

At the core of this IP is a platform technology, which includes holography (patterning within volumes of materials), lithography (patterning surfaces) and medical wireless sensing. These resulting materials created by MMAT include patterned structures that manipulate light, RF and heat (electromagnetic waves) in useful ways that are not obtainable with typical industrial processes widely used.

Moreover, MMAT has developed the design technologies that enable scalable manufacturing. This is a key differentiating factor from other competitors, where a path to commercialization in various industries such as aerospace, medical, automotive, and energy has yet to be accomplished.

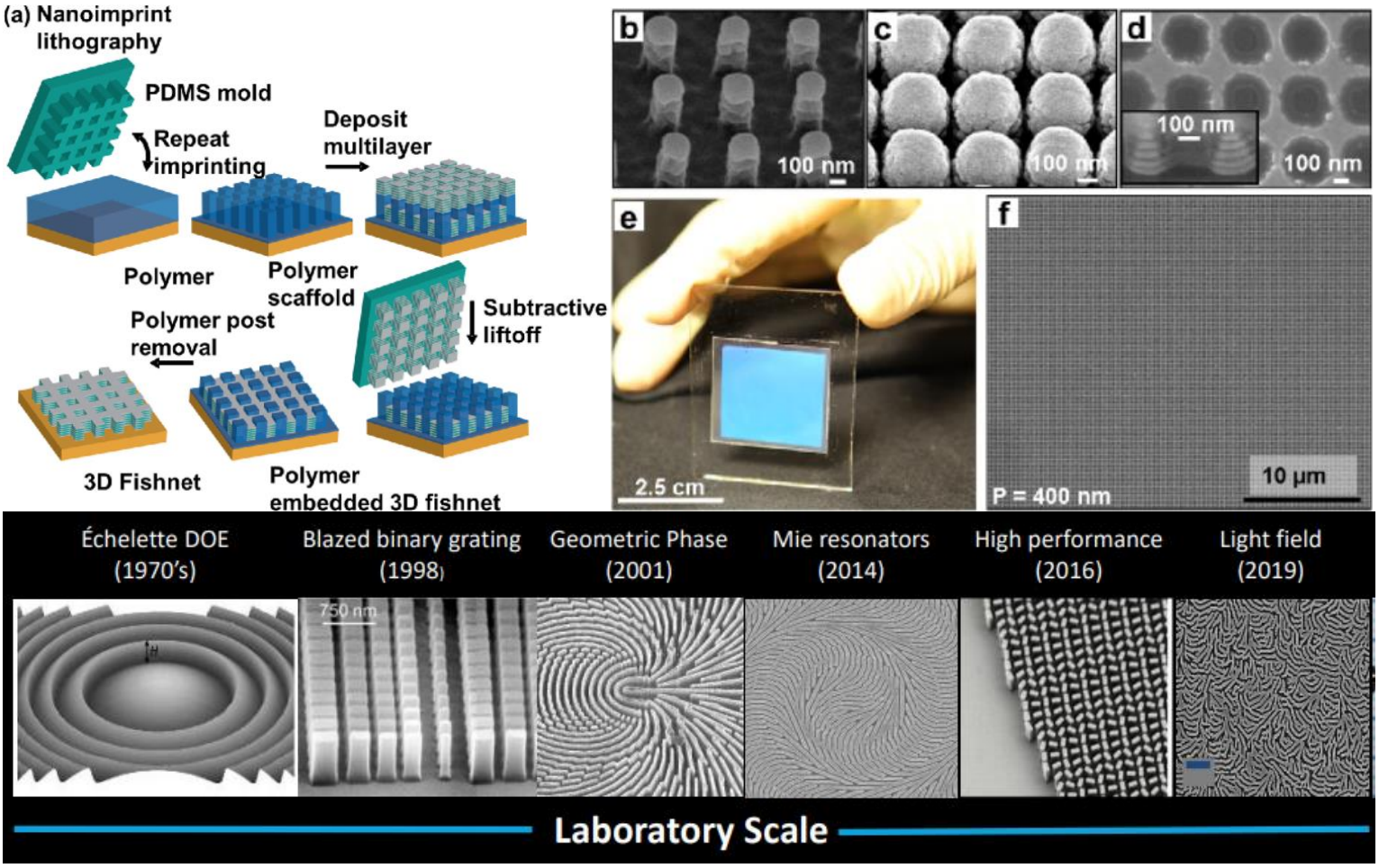
We encourage readers of this report to review our Emerging Ideas report on POET Technologies (PTK-TSXV, Not Rated) (“Smaller, Cheaper, More Reliable: Single Chip Photonics & Electronics”, March 17, 2021), where we provide a brief synopsis of the advancements in computing and telecommunications that were made possible by innovations in the electronic and optics segments of the electronics industry. At the heart of these innovations is the understanding of how light and matter interact and how to exploit their interaction for useful ends.

However, applications beyond semiconductor electronics/optics are now possible as the past 20 years have seen advancements in techniques to produce a wider range of nanostructures. These advancements include discoveries in photonic crystals, nanolithography, plasmonic phenomena and nanoparticle manipulation. The practical combination of these advancements is termed in the material science community as **metamaterials**. These are composite structures, usually fabricated of metals and plastics, that are engineered to provide enhanced levels of reflection, refraction, diffraction, filtering, conductance and other properties.

As shown in Figure 1, such metamaterials are composed of a multitude of individual elements forming a repeating structure at the nanoscale. It is the arrangement in a periodic pattern that results in the manipulation of the light, heat or electromagnetic waves. The shape, size and orientation of the nanostructures affect how light interacts with the material. The development of a pattern to provide the desired functional surface focuses on the structures that can produce unusual and exotic properties, which would not be available naturally. It is the structure of the material more than its composition that gives rise to the unique properties.

MacMurray D. Whale, Ph.D., P.Eng.(416) 943-6708,
mwhale@cormark.com

Figure 1: Examples Of Previous Metamaterials



Source: Metamaterial Inc., Roadmap on optical metamaterials, M. Urbas et al., 2016

MMAT's Platform Technology:

MMAT's platform technology spans holography and lithography with a particular focus on products for aerospace and defense, automotive, energy, healthcare, consumer electronics, and data transmission. Given the broad number of applications, the products are at different levels of development across these end markets. Furthermore, MMAT's approach is to partner with industry leaders in order to co-develop specific applications. MMAT's holographic division is based in Dartmouth, Nova Scotia, Canada.

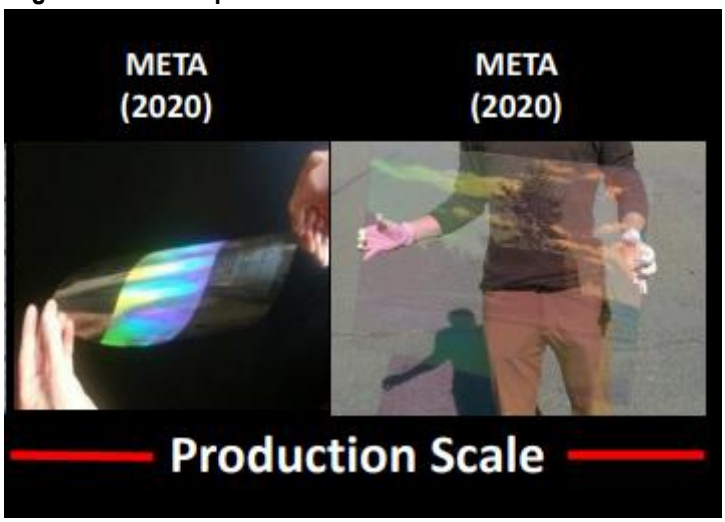
MMAT's technology brings higher speeds, larger scale and lower costs to manufacturing:

- AI software can develop new custom solutions within hours and days rather than months and years,
- Proprietary roll-to-roll production equipment can produce large area and high-volume nanocomposites, and
- Costs are expected to reach single dollars per square meter at volume.

Holography Technology: Holography is a technique where laser light (a collimated, i.e., non-spreading, beam of light from a visible wavelength lasers) directly writes an interference pattern inside the volume of light-sensitive material, usually a photopolymer. This produces a transparent optical filter and can also be used to create holographic optical elements. A variation for large areas is also possible where the laser is scanned across a larger area to produce a nan-structured pattern.

MacMurray D. Whale, Ph.D., P.Eng.(416) 943-6708,
mwhale@cormark.com

Figure 2: Examples Of MMAT's Materials



Source: Metamaterial Inc.

MMAT has successfully introduced an eyewear product, metaAIR® laser glare protection eyewear, which uses this holography technology. The product was co-developed with Airbus SA for laser glare protection for pilots, military and law enforcement. The holographic optical filter blocks and deflects specific colors or wavelengths of light. metaAIR® was launched in 2019 with Satair, a wholly owned Airbus company. Scale-up and commercialization continued through 2020.

MMAT is in the process of developing a product based on its proprietary holography technology that can produce holographic optical elements (HOEs). The technology, metaOPTIXTM, allows the embedding HOEs into the displays used in augmented reality smart glasses and in Heads-Up Displays for automobiles and aircraft. The product was launched commercially in November 2020.

Lithography Technology: Manufacturing nano-scale structures at high speed and over a large area is a key requirement to keep costs down in order to drive adoption. MMAT has pioneered efforts in low-cost nanopatterning through its development of a new nanolithography method called "Rolling Mask" lithography. This combines the best features of photolithography, soft lithography and roll-to-plate/roll-to-roll printing capability technologies. The approach utilizes a cylindrical mask that acts as a master pattern together with UV light exposure. MMAT designs the master patterns and has built and maintained a growing library of patterns that can be called upon for various applications.

The technique is based on rolling the nanostructured pattern on the mask over a flat targeted surface area thereby writing a nano-pattern into the volume of a light-sensitive material. By depositing an evaporated metal onto this photoresist, filling the grooves, a metal pattern can be formed by removing the excess metal. This results in the formation of an invisible conductive metal mesh-patterned surface. It can be fabricated onto any glass or plastic transparent surface in order to offer high transparency, high conductivity and low haze smart materials.

The principal prototype product from this division is a film called NANOWEB®, which MMAT produces in metre-long samples from its US subsidiary at small volumes. Five products are currently being developed: transparent EMI Shielding, transparent antennas, touch screen sensors, solar cells and transparent heating to de-ice and de-fog. Prototypes are being evaluated and in market trials with potential customers.

MacMurray D. Whale, Ph.D., P.Eng.(416) 943-6708,
mwhale@cormark.com

Wireless Sensing Technology: From its UK office, MMAT is developing a set of products that improve medical imaging diagnostics. MMAT's wireless sensing technology relies on cancelling reflections of radiation from the skin to increase the signal-to-noise-ratio resulting from transmission through body tissue. Proprietary patterned designs that are printed on metal-dielectric structures on flexible substrates act as anti-reflection coating when placed over the human skin in combination with medical diagnostics, such as MRI, ultrasound systems, non-invasive glucometers, etc.

MMAT is currently developing metaSURFACE™, or RadiWise™, which allows up to 40 times more energy to be transmitted through the human tissue rather than having it reflect, which increases both the speed and imaging accuracy of the scans. This increases patient throughput for healthcare providers.

Growing IP Position: MMAT has 76 patents granted and 64 pending applications in 44 patent families, 28 of which are granted, with 7 registered trademarks. In addition, MMAT has additional intellectual property that is maintained confidentially by way of trade secrets, providing the company with a significant competitive advantage. We expect this to manifest itself in marketing benefits and licensing revenue opportunities.

Technical Achievements Have brought Important Awards: MMAT's activity in the metamaterial space has brought it several important awards. In January 2019, MMAT was named one of the Global Cleantech 100 companies in the world, out of over 13,000 innovators from over 90 countries.

Also in the same month, Dalhousie University and Mitacs announced a $1.6 MM collaboration to explore different areas of application of metamaterial including absorption enhancement of ultra-thin solar cells, light emission enhancement for LEDs, development of next-generation optics for augmented reality applications and development of a wearable thin-film glucose sensor. This was Mitacs' largest supported project in Atlantic Canada.

In May 2019, MMAT received the prestigious Silver A' Design Award in Safety Clothing and Personal Protective Equipment Design Category, from the A' Design Award and Competition in Italy for its metaAIR® eyewear.

Application And Market Highlights:

Transparent Window Films: One of the major challenges to outdoor 5G coverage is related to the need for these high-speed signals to have line of site from base stations to devices. In the urban environment this can be a challenge. MMAT has created a transparent film that can be placed on windows to reflect signals into dead zone areas.

Similarly, for indoor applications, MMAT has created a product to enhance 5G and digital TV signal reception. Because 5G signals do not penetrate glass effectively, internal networks are being installed. MMAT's films act as invisible antenna that can allow the windows to pass through signals.

Automotive Components: ADAS and autonomous vehicles use a myriad of sensors to map the surroundings. These sensors can be susceptible to degradation owing to ice and fog. MMAT has developed heaters that are transparent to both radar and LIDAR technologies. The conductive films provide de-icing and defogging without any sensor degradation.

Solar Energy: MMAT is developing a product to improve the absorption of sunlight by solar panels. Its thin sheet of nanostructured film allows sunlight to be captured from all angles, which can eliminate the use of costly tracking systems. Furthermore, because it is thin, light and flexible it can be used for transportation applications and for onboard charging. MMAT's roll-to-roll technology allows for coverage of large areas cost effectively. The end result is an increase in the solar cell conversion efficiency. There is a total $5 B TAM associated with filters for the solar industry.

MacMurray D. Whale, Ph.D., P.Eng.(416) 943-6708,
mwhale@cormark.com

Augmented Reality Applications: MMAT has created products that integrate the optical elements of augmented reality with eyewear lens casting technology. MMAT acquired IP from Swiss lens maker, Interglass Technology AG, including 35 patents, trade secrets and proprietary software. The materials solution uses materials supplied in partnership with Covestro AG. The just-in-time production of prescription lenses and embedded elements, such as eye trackers and optical elements are expected to bring significant market opportunities. This market is estimated to be in excess of $1.5 B annually.

Medical Applications: As shown in Figure 3, MMAT is developing functional metamaterials for the health and wellness market. These include applications in medical imaging enhancement and films for imaging used in breast cancer screening. In the sensor area, MMAT has developed films that serve as sensors for non-invasive glucometers as well as for other diagnostic areas that can be used at the point of care for testing. As shown in the figure, MMAT estimates these markets to amount to a TAM of more than $30 B.

Figure 3: Medical Imaging and Sensor Technology Examples

Source: Metamaterial Inc.

Market Creation From The Convergence Of Trends:

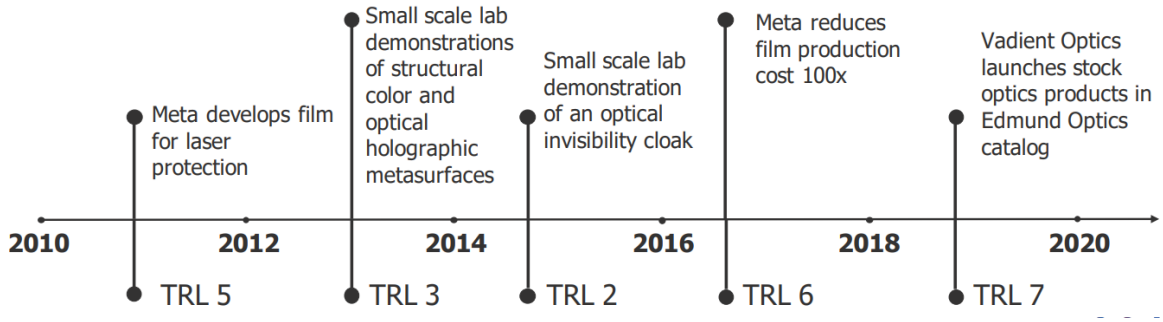
Recently, LUX Research, a research and consulting firm, completed an industry study of the optical metamaterials technology field, examining five key factors: product, technology readiness, market, organization and production. A main conclusion of the report is that these technologies will begin to make an impact on the lens manufacturing industry this year. While more materials with more unique properties for medicine and optical computing are at an earlier stage of deployment.

As shown in Figure 4, the industry is currently at a technology readiness level from 4 to 9. This metric is based on the US DoE's TRL scale. The simplest materials are relatively straightforward to produce and scale; however, there is an uneven commercial maturity depending on the end market segment. Proof of concept for all major functionalities was completed in the lab years ago and now design software gaps have become quite narrow.

In addition, commercial launches have begun with costs continuing to fall. As a result, partnerships between larger more mature corporations and smaller more nascent technology developers have begun.

MacMurray D. Whale, Ph.D., P.Eng.(416) 943-6708,
mwhale@cormark.com

Figure 4: Technology Readiness Level



Source: LUX Research Inc.

Lux Research Estimates a $50 B TAM In Lens/Optics Segments: With partnerships at an early stage, the fastest growth period for adoption is anticipated to be over the next 5 years with a significantly higher rate than GDP. The key early adopting markets are anticipated to be the cell phone camera market and the corrective lens markets, which can support $40 B in sales.

As we noted above, the biomedical markets total more than $30 B, and with the automotive and 5G markets, we estimate that MMAT's TAM is in excess of $80 B owing to a broad technology applicability.

Largest Barrier Remains Low Production Levels: However, there remain not only capacity scale up issues on the supply side in the market, but also production costs remain high despite rapid declines recently.

A second key barrier to adoption is that most of the leading-edge development is being performed by a number of small players and academic labs with limited resources. As noted, partnerships with larger players are increasing, including announcements in the industry from Lockheed Martin, Intel, 3M, Edmund Optics, Airbus, Applied Materials and TDK. Figure 5 shows that MMAT is active with many important larger players.

Figure 5: Selected Target Partners And Customers

Source: Metamaterial Inc.

MacMurray D. Whale, Ph.D., P.Eng.(416) 943-6708,
mwhale@cormark.com

None Of The Competition Has As Broad Exposure:

Optical metamaterials have a broad application across a number of verticals. As a result, the competition landscape is varied with respect to end market, technology focus as well as size and maturity of the competitor.

As shown in Figure 6, MMAT segments its competition into five categories from those focused on the emerging disruptive opportunities to larger specialty chemicals/materials companies which include giants such as 3M, Dow, BASF and Merck.

MMAT brings design capabilities that can address a wide range of end markets from semiconductors to ITO coatings and carbon nanomaterials.

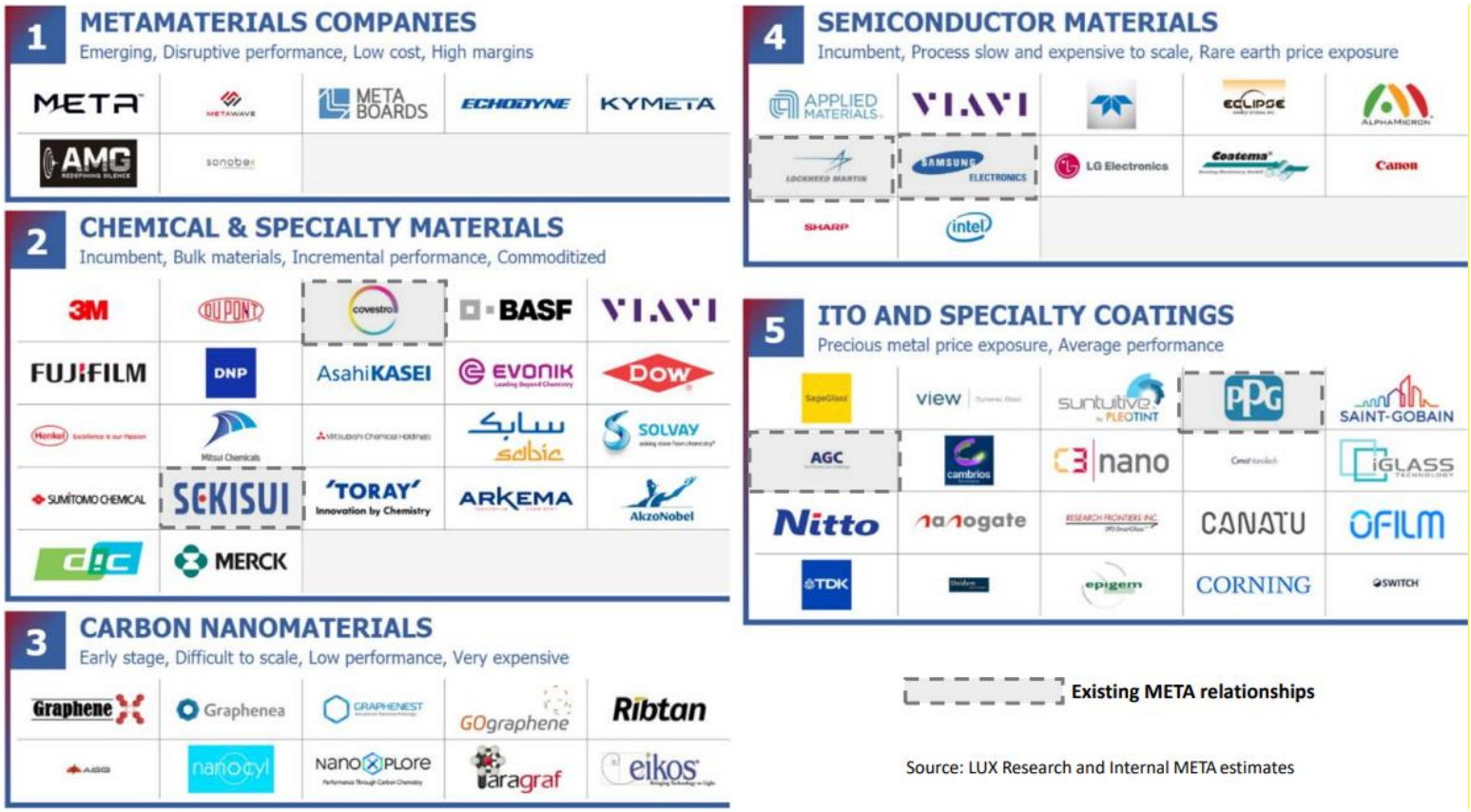
In order to reduce risk to penetration and adoption, MMAT is working with a number of industry players already active in the space. In semiconductors, MMAT is working with Lockheed Martin and Samsung Electronics, in Specialty Coatings with AGC, and in speciality materials with Covestro AG and Sekisui Chemicals.

MMAT is able to bring significant benefits to each. In the semiconductor space, processes are typically wafer-sized batch making them slow and expensive to scale, but MMAT is pioneering roll-to-roll technology that can add throughput and scale advantages for the first time, using substrates of 1 meter width or more.

In the ITO space, suppliers typically have high exposure to precious metals yet only produce average levels of performance, two things that MMAT can improve upon.

In the carbon nanomaterials markets, competitors have relatively low performance improvements from their materials with relatively high-cost production. Again, two factors that MMAT's optical solutions can improve upon.

Figure 6: Competitive Landscape



Source: Metamaterial Inc.

MacMurray D. Whale, Ph.D., P.Eng. (416) 943-6708, mwhale@cormark.com

Operating Facilities:

In Q4/19, MMAT installed its lithographic capabilities in Dartmouth, NS, Canada, and also enhanced its lithography fabrication equipment at its facility located in Silicon Valley, California. In early 2021, the facility in Dartmouth was expanded by 15,000 sq. ft to 68,000 sq. ft. and its California R&D labs have doubled.

Earlier in 2019, MMAT completed the setup of its metaAIR® eyewear production facility to serve several airlines for in-market flight tests through its distributor, Satair. MMAT sold 50 units during 2019 and it is further increasing its reach to airlines through Airbus and Satair.

MMAT is headquartered in Dartmouth, Nova Scotia, and has offices in London, UK, and Pleasanton, California.

Business Development Activities:

MMAT's business model is built upon six revenue streams that depend on the particular end market, maturity of the technology, nature of the relationship with the customers and the pace of adoption by the market.

- License fee
- Master-supply agreement
- Royalties
- Equipment Supply
- Raw Material Supply agreements
- Service contracts on MMAT-owned technology

These revenue opportunities are related to three main activities: design verification, performance validation and production at scale:

- **Design verification:** This involves the production of samples at low volume to meet a customer specification. Test samples provide scope for funded research at the next level.
- **Performance validation:** In this stage, MMAT produces beta samples in lot sizes for the customer to use and evaluate. This stage is expected to result in a pilot-scale production contract.
- **Production at scale:** With a focus on cost, production a pilot scale is conducted with a commercial scale license and material supply agreement expected to be obtained on successful completion.

Over the course of the past year, MMAT has made significant progress on business development along this path from early-stage collaboration to production. Below will list some of these major milestones:

- **Covestro Agreement:** In Q3/20, MMAT and Covestro Deutschland AG signed a three-year supply deal for its photo-sensitive holographic film materials. This allows early access to Covestro's R&D library of photopolymer films, which we expect will accelerate product development. Target markets include photonics/optical filters and holographic optical elements, diffusers, laser eye protection, optical combiners, and augmented reality applications.
- **NANOWEB® Purchase Orders:** In 2019 and 2020, MMAT delivered NANOWEB® proof of concept and product samples to OEMs in Japan, Israel, the US, South Korea, Germany, and China. Purchase orders were received and samples delivered for testing in solar and energy product applications.
- **HOE Follow-on Orders:** In Dec. 2019, purchase orders were received for its second holographic product HOEs from an established consumer electronic industry leader.

MacMurray D. Whale, Ph.D., P.Eng.(416) 943-6708,
mwhale@cormark.com

- **SOFWERX Agreement:** In August 2019, MMAT's US subsidiary signed an agreement with SOFWERX, an innovation hub for the US government to develop films for de-fogging applications to be applied on wearable equipment such as gas masks and diving masks. A working prototype was provided in early 2020, and SOFWERX granted approval to move to the next stage including delivery of 40 samples.

Financial And Corporate Activities:

MMAT has accomplished a fair amount of development on a relatively small amount of capital raised. In early 2020, MMAT obtained secured debenture financing from BDC Capital Inc., a wholly owned subsidiary of the Business Development Bank of Canada, in the amount of $5 MM to which an additional $0.5 MM was added. This debenture plus interest was converted into 7.7 MM shares of MMAT, resulting in a realized fair value loss.

In November 2020, MMAT entered into a loan agreement with a shareholder for $5.5 MM in debt financing to fund operations through to the completion of the arrangement with Torchlight. Together with interest accrued, this loan was converted into 11.1 MM shares, resulting in a non-cash realized fair value loss.

In September 2020, Torchlight Energy Resources Inc., the company used for MMAT's RTO onto the Nasdaq, loaned US$11 MM to MMAT by way of unsecured convertible promissory notes Currently, this obligation amounts to $13.3 MM as a convertible promissory note in the current liabilities on the balance sheet.

In Q4/20, MMAT received funds from the Atlantic Canada Opportunities Agency under its Regional Economic Growth Through Innovation — Business Scale-up and Productivity stream. MMAT receives an interest-free loan of up to $0.39 MM, repayable in 36 monthly installments starting April 1, 2023.

MMAT also completed the conversion of other unsecured debentures into stock, amounting to the issuance of 2.7 MM shares, also resulting in a realized fair value loss.

RTO With Torchlight: In order to access US investors more easily than a Canadian listing can allow, MMAT has entered into a Reverse takeover of Torchlight Energy Resources (TRCH – NASDAQ), by way of a Plan of Arrangement. After completion, Torchlight's pre-arrangement stockholders will own 25.0% of the new combined company post-closing. In exchange, TRCH will issue shares of its common stock to holders of MMAT common shares, representing approximately 75.0% ownership in the combined company. (TRCH completed the expected pre-arrangement raise which amounted to US$27.6 MM in February, resulting in the final ownership split to be approximately 27%/73%.) The current management team at MMAT will operate the combined company post-closing.

(Note that Torchlight owns oil and gas assets. Prior to the effective date of the closing of the Arrangement, Torchlight will declare and issue shares of Series A preferred stock to holders of Torchlight common stock representing 100% of the value of its existing oil and gas assets.)

From a debt perspective after the completion of the transaction with Torchlight, MMAT will have approximately $6.5 MM in total debt. Shares outstanding will be approximately 530 MM, with approximately US$26 MM in cash.

Investment Focused On Four Main Activities: Over this year and next, MMAT has indicated that its priorities are to acquire and launch a pilot scale roll-to-roll functional film production capability, which is estimated to require $10 MM of capex. This is expected to bring its roll-to-roll equipment into operation in the first half of 2022.

In addition, MMAT expects to complete a customer center which will house a pilot line with the aim to license, train and sell duplicates internationally. In the Healthcare and Wellness segment, which is benefitting from current customer engagements, MMAT expects to invest $3 MM in spending. In applied R&D, with an increased headcount, MMAT will see spending increase by $3 MM.

MacMurray D. Whale, Ph.D., P.Eng. (416) 943-6708, mwhale@cormark.com

Over the past several years, MMAT has been spending approximately $5.5 MM annually on an operating cash flow basis, with revenue just over $1 MM from development fees, indicating a burn rate of approximately $900k per month. As a result, following the RTO with Torchlight, MMAT should have sufficient cash to fund its continuing operations, with sufficient resources to ramp up development activities ahead of growing demand, which we anticipate to grow through the course of the next 18 months.

As shown in Figure 7, we provide two sets of comparables as there are no very close comparables to MMAT. The primary group are suppliers of specialty materials in the semiconductor, specialty metals, graphene and rare earth verticals. They share with MMAT a highlight engineered product offering, but all produce revenue from sale of materials rather than licensing or consulting. The companies trade on average in the range of 11x to 13x EV to EBITDA and 3x to 6x sales.

The larger chemical companies are diversified and more mature. As industry bellwethers they have lower growth rates, however, they provide a reasonable insight into a longer-term valuation for MMAT.

Figure 7: Comparables

	Capitalization			Valuation							
	Share	Market	Ent.	EV / EBITDA			EV / Sales			EBITDA	Net Dbt/
(US$MM, unless noted)	Price	Cap.	Value	20	21E	22E	20	21E	22E	Margin	EBITDA
Primary											
5N Plus Inc	C$3.08	207	223	7.7x	8.0x	5.9x	1.3x	1.1x	0.9x	17.0%	0.5x
AXT Inc	$10.18	431	368	34.1x	17.2x	15.9x	3.9x	2.9x	2.7x	11.5%	-5.8x
Metamaterial Inc	C$5.63	492	502	NA	NA	NA	NA	NA	NA	-	-
NanoXplore Inc	C$3.11	406	408	NA	NA	21.2x	8.9x	7.0x	4.2x	(9.4%)	-0.5x
Neo Perf. Materials Inc	C$18.41	576	510	21.1x	7.5x	7.8x	1.6x	1.1x	1.1x	7.5%	-2.7x
POET Technologies Inc	C$1.11	318	315	NA	NA	NA	NA	NA	21.0x	0.0%	-
Average				***21x***	***11x***	***13x***	***3.9x***	***3.0x***	***6.0x***	***0.1x***	***-2.1x***
Median				***21.1x***	***8.0x***	***11.8x***	***2.8x***	***2.0x***	***2.7x***	***0.1x***	***-1.6x***
Secondary											
3M Co	$203.13	117,749	132,025	15.6x	14.0x	13.1x	4.1x	3.8x	3.7x	26.5%	1.7x
BASF SE	€ 67.54	75,272	95,111	10.7x	8.1x	7.9x	1.3x	1.2x	1.1x	12.5%	2.2x
Dow Inc	$67.99	50,788	62,791	11.6x	6.2x	6.8x	1.7x	1.3x	1.3x	14.4%	2.2x
PPG Industries Inc	$177.39	42,032	45,955	19.3x	15.0x	13.9x	3.4x	2.8x	2.6x	17.4%	1.7x
Average				***14x***	***11x***	***10x***	***2.6x***	***2.3x***	***2.2x***	***0.2x***	***1.9x***
Median				***13.6x***	***11.0x***	***10.5x***	***2.5x***	***2.0x***	***1.9x***	***0.2x***	***1.9x***

Source: Cormark Securities Inc.

MacMurray D. Whale, Ph.D., P.Eng.(416) 943-6708,
mwhale@cormark.com

Management:

George Palikaris, Ph.D. President and CEO, Founder: 12 years in leadership positions of high-tech start-ups. Goldman Sachs (10KSB), MIT Enterprise and EY awards for entrepreneurship, Stanford, Harvard, INSEAD Exec Ed. 50+ patents, 3 industry awards.

Kenneth Rice, MBA, JD, LLM Chief Financial Officer & EVP: 30+ years experience, public and private company CFO, in-house counsel, operations, and corporate development executive in technology and life sciences.

Jonathan Waldern, Ph.D. Chief Technology Officer: 25 years experience in commercialization of holographic and lithographic/nanomaterials for photonic applications, inventor and visionary with 140+ patents.

Gardner Wade, Chief Product Officer: 20+ years in managing development engineering of high-definition optical eyewear for global brands in military, flight and performance sports applications.

Themos Kallos, Ph.D. Chief Science Officer, Co-Founder: 10 years experience in applied physics, intellectual property development in metamaterial applications, 40+ filed patents and 50+ publications.

Scott Richards, Chief Marketing Officer: 20+ years in management consulting and marketing services, CEO, CMO, COO, strategic planning, and M&A, in Canada, the Caribbean, the UAE, and the US.

Investment Risks:

- **Competition:** Optical metamaterials is a topical area of technology development with a number of companies pursuing similar markets as MMAT. However, as noted above, many of these competitors are at an early stage of development and most are focused on a narrower set of opportunities.
- **Limited Operating History:** To date, MMAT's revenues have been very low and limited to development fees. As a result, there remains a material uncertainty regarding MMAT's ability to drive revenue higher.
- **Technology Acceptance Risk:** MMAT's first product, the laser protection eyewear was launched in March 2019. This is the only industry-approved solution, and it offers unique benefits. Yet after $2.6 MM in investment by Airbus on 50 units have been sold. For earlier stage opportunities in the automotive space, product development and testing are essential before adoption. These activities usually take 2-3 years and there is no guarantee the customers will accept the product.
- **Manufacturing Scale up:** MMAT has recently built a new facility for manufacturing. The roll-to-roll technology has not reached a high level of maturity and its long-term performance remains unknown.
- **Regulatory Risk:** Products in the medical space require extensive evaluation before adoption. Some may be subject to expensive, risky and time-consuming trials with patients.
- **Currency Risk:** Any significant fluctuation between Canadian and US dollar may have adverse impact on the operations.
- **Supply Chain:** The company depends on third-party suppliers. Shortage of materials or failure to deliver components on time may disrupt the company's operations.