

# Dr Dube and Greg Fenton on ZEN's potential graphene-based antibiotic, antiviral and antifungal compound

In a recent InvestorIntel interview, Peter Clausi speaks with Dr. Francis Dube, Executive Chairman, and Greg Fenton, CEO and Director of ZEN Graphene Solutions Ltd. (TSXV: ZEN), about ZEN Graphene's potential graphene-based antibiotic, antiviral and antifungal compound which could be a medical breakthrough in the treatment of numerous human-contracted pathogens including COVID-19.

In this InvestorIntel interview, which may also be viewed on YouTube (click here to subscribe to the **InvestorIntel Channel**), Greg went on to say, "We unfortunately had to shut down most of our research and development due to COVID-19." He continued, "Fortunate for us, we had just opened up our own research lab in Guelph. **We joined together with our research partners and tested to see if there was anything we could do to help beat this virus.**"

Dr. Dube told InvestorIntel that ZEN Graphene has already filed patent for a graphene-based virucidal ink to be used in masks, PPE and the HVAC (Heating, ventilation, and air conditioning) sector. He added that the company is now exploring graphene's use in the fight against the current global pandemic.

On December 22, 2020, ZEN Graphene Solutions announced that it had developed a potential graphene-based antibiotic, antiviral and antifungal compound. Commenting on this news release Greg said, "The versatility of this product is way beyond anything even we could have imagined. Not only the range of pathogens

that it is effective against, but how it can be deployed and utilized. **It went from us simply talking about bringing our product into coating, to us talking about actually bringing it into the body.**"

To watch the full interview, [click here](#)

#### **About ZEN Graphene Solutions Ltd.**

ZEN is a graphene technology solutions company with a focus on the development of graphene based nanomaterial products and applications. The unique Albany Graphite Project provides the company with a potential competitive advantage in the graphene market as independent labs in Japan, UK, Israel, USA and Canada have independently demonstrated that ZEN's Albany Pure™ Graphite is an ideal precursor material which easily converts (exfoliates) to graphene, using a variety of mechanical, chemical and electrochemical methods. ZEN is focused on commercializing a patent pending graphene-based coating with 99% viricidal activity against

To learn more about ZEN Graphene Solutions Ltd., [click here](#)

**ZEN Graphene Disclaimer:** The Company is not making any express or implied claims that its product has the ability to eliminate, cure or contain the COVID-19 (or SARS-2 Coronavirus) at this time. The company must receive Health Canada or FDA approvals for any of the products or solutions discussed.

**InvestorIntel Disclaimer:** ZEN Graphene Solutions Ltd. is an advertorial member of InvestorIntel Corp.

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# The marvels of graphene technology kick off 2021 with ZEN focused on our health

While we were getting ready for Christmas, on December 22, 2020, ZEN Graphene Solutions Ltd. (TSXV: ZEN) made my head explode.

Well, almost – and there is probably a cure for that (ultimately). But in the meantime, the company's announcement has rocked ZEN shareholder's world with a share price increase of just over 50% in a matter of days.

In case you missed it, the press release is [here](#) (and watch a great interview with senior management [here](#)) as the company reveals the potential blockbusting impact of its graphene science. You might recall that ZEN is working on a virucidal ink for coating masks, but the most recent news is yet another example of the marvels of graphene technology.

Many people know of graphene for its strength (200 times stronger than steel) and ability to conduct heat (10 times more effective than copper) and conduct electricity (1,000 times better than copper), but the world is just coming to understand the biomedical attributes of the diamond that didn't grow up.

Graphene is a two-dimensional, single layer "crystal" of pure carbon, which is inert. Attaching minute amounts of active "ingredients" to the graphene has resulted in a potential new compound which could be used as an antibiotic, antiviral or antifungal treatment.

That bears repeating, because this is potentially a huge breakthrough.

**An alternative that could be used as an antibiotic, antiviral or antifungal treatment.**

Recently received testing results from the University Health Network/Mount Sinai Hospital Department of Microbiology in Toronto indicate that this patent pending formulation could be a medical breakthrough in the treatment of numerous human-contracted pathogens.

The company commenced cytotoxicity (toxicity to cells) studies in lab animals in October 2020, with results expected in January 2021. Pending the outcome of the testing to demonstrate the safety of the graphene compound, upon successful completion the company will then seek to move immediately to human trials in 2021 with one or more pharma partners.

Immediate and obvious uses for a successful graphene compound product would be the potential use to treat infection of upper and lower respiratory tract – where COVID-19 is a major contributor – via a dry-powder inhaler or a nasal spray to maximize local concentrations directly at the site of infection. Other immediate obvious uses are the potential role in ear, eye, and fungal infections treatments.

**If the graphene compound is shown to be safe and effective in human trials, subject to regulatory approvals, it would also provide a viable alternative to many of the antibiotic-resistant super-bugs.**

Think about that – we all know someone who has had an issue with this and it is becoming unfortunately more common in hospital care.

The potential impact of this discovery and breakthrough should not be underestimated. The world has thus-far mostly focussed on the mechanical and physical aspects of using graphene as an enhancer. A new potential medical treatment? Antibiotic, antiviral or antifungal all in one?

Boom – just made my head explode...again!

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## **ZEN Graphene set to supply a virucidal coating for a minimum 100 million masks**

This week ZEN Graphene Solutions Ltd. (TSXV: ZEN) (“ZEN”) and Trebor RX Corp. (“Trebor”) signed a Binding Letter of Intent (LOI) that includes the initial purchase of ZEN’s patent pending graphene based virucidal coating for **a minimum of 100 million masks/filters** with pricing of these mask/filters being variable based on a number of factors.

This news follows the highly successful testing of ZEN’s graphene based silver colloidal coating announced on September 22, 2020. Some of the announcement highlights are shown below:

- ZEN’s Virucidal ink is **99% effective against the COVID-19 virus.**
- ZEN’s Virucidal ink was still 99% effective a minimum of 35 days after application to N95 mask material.
- ZEN is now developing plans to expedite commercialization of this product, pending regulatory approval.
- ZEN has filed a provisional patent for this graphene-based virucidal product.....
- Very significant virucidal activity was recorded and reported, achieving 99% inactivation of the virus for both samples in 3 separate tests each and verified through a second round of testing...”

But back to the latest potentially game changing news for ZEN

of the LOI for a minimum of 100 million masks/filters from Trebor. An order of this size for a relatively small company like ZEN is highly significant. Greg Fenton, ZEN's Chief Strategy Officer, commented (Nov. 9, 2020):

**“This is a historic day for ZEN. The signing of this significant commercial agreement is a watershed moment for our organization.** Moreover, it is an honour for ZEN to partner with a Canadian company like Trebor and develop a 100% Canadian solution in the fight against the COVID-19 pandemic. The innovation of the Trebor Pro+ Respirator Mask will set a new standard in the mask industry and, combined with our viricidal coating, will bring a new level of safety for our front-line workers....”

Trebor's CEO George Irwin agreed stating: “This is truly a game changer in the PPE space....”



### **PRO+ Respirator Mask**

It looks like the market also agrees with ZEN, up 358% over the past 1 year, and up 293% since I wrote “ZEN Graphene Solutions moves towards commercialization of virus-killing mask” back on September 8, 2020.

ZEN Graphene Solutions stock price is up 358% over the past 1 year, and up 293% since September 8, 2020



Source

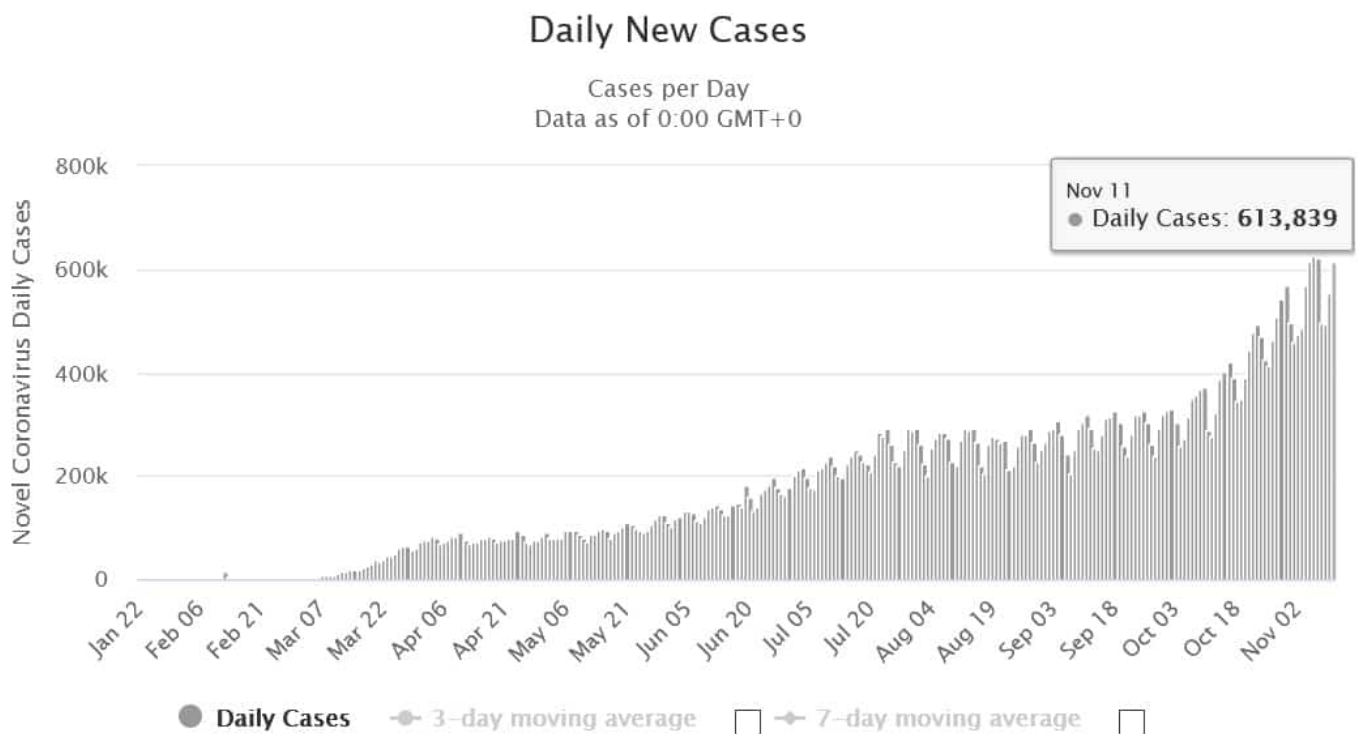
What we know so far is that ZEN and Trebor have signed a LOI and that Trebor is a Canadian personal protective equipment mask manufacturer with an initial production facility located in Collingwood, Ontario, Canada. The announcement on the binding LOI includes several key points:

1. Initial first year production is planned to use ZEN's patent pending graphene based viricidal coating for a **minimum of 100 million masks/filters.**
2. Pricing of these mask/filters being variable based on a number of factors.
3. This initial minimum order is for the first year and is **subject to Health Canada approvals.**
4. ZEN's viricidal coating will be used on Trebor's patent pending Pro+ Respirator Mask (Pro+) N95 mask and also on their 3-ply surgical mask.

For now, we can only speculate on what the commercial terms

would be and what other agreements may follow. What we do know is that the global market demand for face masks is enormous, certainly in the billions. Some have even called the face mask 'the world's most valuable commodity'. It is estimated that production of the highly protective N95 face masks in the United States alone will increase to 180 million units per month by the end/winter months of 2020.

## **Demand for face masks is only increasing as global new COVID-19 cases continue to accelerate higher**



### Source

Under a Biden presidency it looks highly probable that face masks will be viewed more positively than what happened under Trump. Back in June 2020, CNN quoted: "Biden says he would make wearing face masks mandatory for Americans amid coronavirus pandemic." This week Biden has announced a new COVID-19 taskforce to begin work immediately and continue after he is sworn in as president on January 20.

Global daily new cases of COVID-19 have been accelerating and are now averaging **a staggering 600,000 new cases per day**, for



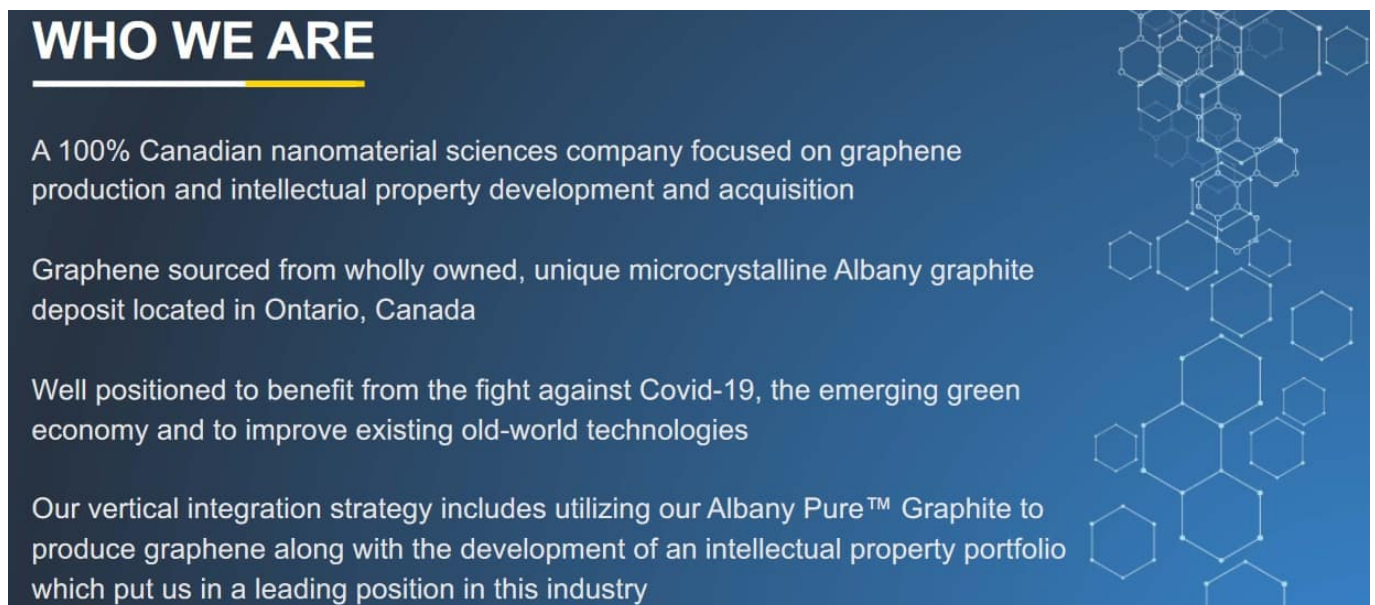
a total of over 52 million cases now globally.

All of this should lead to very strong demand for face masks in the year ahead.

Beyond COVID-19 ZEN has many other potential areas and deals to commercialize their graphene. Some recent deals include a collaboration agreement on Carbon Aerogels with German Aerospace Centre and a partnership with the Royal Canadian Navy and Evercloak to test Graphene Oxide Dehumidification Membrane Technology.

To meet all this new demand ZEN has had to double their lab space starting January 1, 2020 and announced this week that ZEN will lease a 25,680 square feet space in Guelph, Ontario to become ZEN's new manufacturing facility and corporate headquarters. ZEN stated: "The company expects to begin initial production in Q4 2020 for incorporation into masks, other PPE and for HVAC filters and prefilters."

## **A summary of ZEN Graphene Solutions**

The slide features a dark blue background with a white hexagonal molecular structure pattern on the right side. The text is white and arranged in a list-like format. The title 'WHO WE ARE' is underlined with a yellow bar. The content describes the company's focus on graphene production, its sourcing from a unique deposit in Ontario, its strategic positioning for the fight against COVID-19 and the green economy, and its vertical integration strategy.

**WHO WE ARE**

A 100% Canadian nanomaterial sciences company focused on graphene production and intellectual property development and acquisition

Graphene sourced from wholly owned, unique microcrystalline Albany graphite deposit located in Ontario, Canada

Well positioned to benefit from the fight against Covid-19, the emerging green economy and to improve existing old-world technologies

Our vertical integration strategy includes utilizing our Albany Pure™ Graphite to produce graphene along with the development of an intellectual property portfolio which put us in a leading position in this industry

Source

## **Closing remarks**

ZEN Graphene Solution's management is doing a tremendous job.

Pivoting in 2020 to produce a viricidal graphene coating was a genius move. Of course COVID-19 will come and eventually go, but demand for industry leading graphene products looks set to boom this decade as the world learns more about the wonders of graphene.

ZEN Graphene Solutions has a market cap of C\$139M and right now appears to have the world at their feet.

*Disclosure: The author is long ZEN Graphene Solutions Ltd. (TSXV: ZEN).*

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## **Dr. Dube on competitive graphene technology and the recent testing partnership between ZEN, the Royal Canadian Navy and Evercloak**

In a recent interview with **InvestorIntel**, Tracy Weslosky speaks with Dr. Francis Dube, CEO and Director of ZEN Graphene Solutions Ltd. (TSXV: ZEN) about their partnership with Royal Canadian Navy and Evercloak to test graphene oxide dehumidification membrane technology.

In an InvestorIntel interview that can also be viewed on our InvestorIntel YouTube channel, Dr. Dube said, “We can make a membrane that is based on our graphene oxide and that material now enables a new technology that filters out moisture in air before this air gets into an air conditioning unit.” He added that by removing moisture from air, the air

conditioning unit uses less energy and requires less maintenance. “We can reduce air conditioning energy requirement by 75%...” Dr. Dube claimed.

Dr. Dube also provided an update on ZEN’s graphene oxide production method and the competitive environmental advantages of this technology.

To watch the full interview, [click here](#)

To learn more about ZEN Graphene Solutions Ltd., [click here](#)

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## **Dr. Francis Dube on the advancement of mask technologies and ZEN’s graphene based virucidal ink with 99% efficacy**

InvestorIntel’s Tracy Weslosky speaks with Dr. Francis Dube, CEO and Director of ZEN Graphene Solutions Ltd. (TSXV: ZEN), about ZEN’s novel graphene based virucidal ink. “We have come up with a coating that can be applied to masks and filter membranes to deactivate the COVID-19 virus,” Dr. Dube told InvestorIntel. “It has been proven at plus 99% efficacy through Western University’s ImPaKT facility which is a Biosafety Level 3 lab.”

In an InvestorIntel interview that can also be viewed on

our InvestorIntel YouTube channel, Dr. Dube went on to say, while the current mask technologies are only meant to filter out particles, masks sprayed with ZEN's graphene-based virucidal ink remains 99% effective in killing COVID-19 virus even after 35 days.

To watch the full interview, [click here](#)

To learn more about ZEN Graphene Solutions Ltd., [click here](#)

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## **Lab tests show ZEN Graphene's virucidal ink 99% effective against COVID-19; patent applied for**

### **Optimization, production scale-up and commercialization planned**

Another month deeper into the global COVID-19 crisis and the world is still looking for effective tools to combat the pandemic. Virus testing is still both not widespread nor accurate enough, and a vaccine still eludes us. Governments and businesses are grimly contemplating the consequences of a second (or is it the third or fourth?) wave and the potential for another economy-crippling, government-sanctioned lockdown. In the meantime, we are all looking for ways to avoid the virus and keep ourselves healthy.

On September 22, 2020, ZEN Graphene Solutions Ltd. (TSXV:ZEN | OTC:ZENYF) announced that after 5 months of optimization, it has **developed and successfully tested a novel graphene-based virucidal ink with 99% effectiveness against COVID-19**. The ink, used as a coating or protective layer on masks and other PPE, was shown to be 99% effective against the COVID-19 virus and significantly was **still 99% effective a minimum of 35 days after application** to N95 mask material. The company is now developing plans to expedite commercialization of this product, pending regulatory approval, and has filed a provisional patent for this graphene-based virucidal product and is beginning antibacterial and antifungal tests utilizing its proprietary virucidal ink formulation.

ZEN Graphene followed up this announcement with more news on September 28, 2020 that the University of Guelph has filed a **provisional patent** regarding an electrochemical exfoliation process to produce graphene oxide (GO) from Albany Pure Graphite. The exfoliation method is designed to be a scalable, low cost, low energy and environmentally friendly method of producing graphene oxide, a key ingredient in ZEN's proprietary virucidal ink.

A virucide is any physical or chemical agent that deactivates or destroys viruses. This differs from an antiviral drug, which inhibits the proliferation of the virus. Virucides are not intended for use inside the body, but they are effective on surfaces outside the body.

In the recent results from Western University's ImPaKT facility Biosafety Level 3 laboratory, two ZEN Graphene graphene-based ink samples at different concentrations were applied to N95 mask filtration media and then exposed to the SARS-CoV-2 virus that causes COVID-19 and tested for antiviral properties. Very significant virucidal activity was recorded and reported, **achieving 99% inactivation of the virus** for both samples in 3 separate tests each and verified through a second round of testing. Of significance, the antiviral effect of the

second round of testing was on material that was prepared 35 days earlier demonstrating the ongoing virucidal activity of ZEN's proprietary ink.

The research and development of this antiviral ink formulation was conducted entirely by ZEN's research team at its Canadian facility using a graphene product that was **produced from its Albany mine graphite.**

The significance of the ZEN Graphene virucidal ink is based on the physical characteristics of graphene. Graphite flakes extracted from the ZEN Albany mine in Ontario to convert to graphene are approximately 9 microns (9,000 nanometers) making conversion to graphene very cost effective. Graphene is 200 times stronger than steel, conducts heat 10 times more than copper and conducts electricity 1,000 times better than copper according to ZEN Chairman and CEO Dr. Francis Dubé.

In other words, you soon could be wearing a mask with the ZEN virucidal ink on it and would not know the difference between that and a non-coated mask. Except to know that you are now actually wearing something that actually kills the coronavirus as it passes through your mask.

There are still multiple steps for ZEN to go through before the virucidal ink is publicly available on personal protective equipment, but this is a big step forward towards commercialization as technology brings society closer to a coronavirus solution. In the meantime, ZEN intends to continue to move rapidly towards optimization, production scale-up and commercialization of its graphene-based ink.

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# ZEN Graphene Solutions moves towards commercialization of virus-killing mask

**ZEN is collaborating with partners to develop virucidal face masks and PPE**

Back in May 2020 InvestorIntel wrote about the very exciting development of masks and other personal protective equipment (PPE) that not only protect the wearer, **but actually kill viruses on contact**. to help . Since then the development of a “graphene virucidal ink face mask” and PPE has been progressing nicely in the fight against COVID-19.

In late July 2020 ZEN Graphene Solutions Ltd. (TSXV: ZEN) (“ZEN”) reported that research teams at a number of personal protective equipment (PPE) manufacturers are collaborating with ZEN to incorporate ZEN’s virus-killing graphene ink into commercial products, including masks, gloves, gowns and other clothing. This follows ZEN’s promising testing results from the University of Western Ontario’s ImPaKT Facility, biosafety Level 3 lab.

ZEN has synthesized a ‘silver nanoparticles functionalized graphene oxide ink’ that has been documented by previous researchers to kill earlier versions of coronavirus. Silver is well known to be a potential virucidal agent.



***Photo: iStock***

In July ZEN reported in a news release that the company “continues to optimize its proprietary formulation for dosage and delivery mechanism for highest antiviral impact. **The next phase of testing is currently underway** at the ImPaKT Facility and includes a preferred mask fabric, from one of our

collaborators, coated in ZEN's virucidal ink exposed to and tested against the COVID-19 virus."

Dr. Francis Dubé, CEO of ZEN, commented that "Based on results so far and our discussions with the team at Western, we are quickly moving to integrate our material into commercial products with partners who wish to increase the level of COVID-19 protection their products currently offer."

Given the world needs at least 3.5b N95 face masks to fight COVID-19, the potential demand for ZEN's graphene based virucidal ink face mask could be enormous. If the new virucidal mask captured just 10% market share of the 3.5 billion masks needed that would mean manufacturing and selling ~350 million masks. Or even if just made mandatory for health care workers globally, the market would be very large, as there is an estimated 59 million health care workers worldwide. Each health care worker would need a number of masks per year. The revenue opportunities could be enormous if ZEN's graphene based virucidal ink is licensed on a per unit basis. Added to this would be the potential for use in other PPE. For a small company such as ZEN the potential revenue upside could be highly significant.

Tests are still underway to improve and prove the effectiveness of the virucidal masks, but CEO Dubé's public comments about integrating ZEN's material into commercial products with partners indicates a positive outcome is looking increasingly possible.

Last week ZEN announced that it will "report shortly on significant progress being made in multiple programs, one of which has resulted in the preparation of a patent filing that is central to ZEN's business plan." Zen also announced receiving **significant funding grants**: "two NSERC Alliance COVID-19 project grants, a Mitacs Elevate Postdoctoral Fellowship grant, and two Mitacs Accelerate grants for a total of \$355,000 to its university collaborators," which increased



ZEN's total research and development budget for the next 12 months to over \$1.4M.

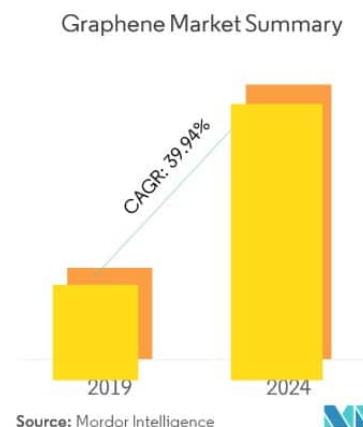
## Graphene's potential

Graphene is a new wonder material with incredible potential to be commercialized in a huge number of products. These are as diverse as graphene coatings that can greatly improve corrosion resistance, increase strength, reduce friction and can be hydrophobic reducing ice formation (aerospace and aircraft industries). As a diesel/jet fuel additive it can improve fuel economy and reduces greenhouse emissions. It is also useful in electromagnetic shielding and electrostatic dissipation, desalinization membranes and low-energy dehumidification, heavy metal scavenging and removing industrial contamination, photovoltaics, displays & biomedical applications using graphene quantum dots, virucidal inks, as a material enhancement (clothes, tire strengthener, concrete additive), hydrogen storage and production, and advanced batteries. Samsung is developing an advanced graphene phone battery. Graphene is super lightweight and also strengthens aluminum, rubber, plastics and other materials, making its list of applications almost endless.

## The graphene market is forecast to grow at a 39-45% CAGR this decade

### A high value growth industry over the next decade

- The 2019 Canaccord UK\* research report estimates worldwide graphene sales are likely to take off over the next few years reaching \$4.8B USD by 2030
- Graphene's commercial potential lies in its ability to enhance and improve existing materials at a very low load factor making it a viable solution in the cost/benefit calculation for commercial applications
- Markets in which graphene is already competing with other additives amount to more than \$150B in value
- Canaccord's central case implies a Compound Annual Growth Rate (CAGR) of 45% in revenue over a decade 2030E from current levels



Source: Company presentation

### **Closing remarks**

In addition to its advanced application projects, **ZEN owns a graphite mine** and has commenced small scale graphene production from their facility in Canada, and has numerous other potential uses to commercialize their graphene product. At the current market cap of just C\$31m the stock is not yet pricing in any chance of significant success in the virucidal mask and PPE market, or in the larger graphene market. This is good news for investors looking for underappreciated and early stage stocks. If ZEN is able to successfully commercialize its viricidal mask/PPE or other graphene products, it would be a game-changer.