HYPERION METALS

ASX RELEASE | ASX: HYM

21 October 2021

HYPERION EXECUTES OPTION AGREEMENT TO ACQUIRE LEADING METALS TECHNOLOGY COMPANY

Overview

- One year option to acquire Blacksand Technology, LLC ("Blacksand"), a leading advanced metals R&D company which has developed breakthrough patented technologies that can produce low carbon, low cost titanium metal and powders
- The combination of Hyperion and Blacksand is transformational – bringing together two highly complementary organizations to establish a world-class advanced materials and critical minerals market leader
- Blacksand was spun-out of the University of Utah in 2013 and, led by founder Dr. Zak Fang, along with Dr. Kesh Keshavan and Dr. Pei Sun, has achieved major milestones including;
  - Development of the HAMR process and other advanced metals technologies based on the scientific breakthrough by Dr. Fang linked to the hydrogen destabilization of metal oxides;
  - Development of 5 core patent families (over 40 patents worldwide) covering the supply chain from primary titanium metal production to downstream titanium manufacturing, focused on these technologies that can produce low cost and low carbon titanium and other critical metals;
  - Total investment of US$12m into the development of these patented technologies, including funding of over US$7 million from government agencies including ARPA-E/DOE, EERE/DOE, NSF, and NAVAIR/DOD;
  - The development and commissioning of a titanium metal powder production facility in Salt Lake City, Utah currently producing titanium powder for commercial qualification with prospective customers; and
  - The establishment of strong relationships within industry, including with major aerospace and defense companies and U.S. government agencies

Strategic Rationale

If Hyperion exercises its option to purchase Blacksand, Hyperion will have:

- Established a world class advanced materials market leader with the potential to offer low cost, low carbon and sustainable all-American metal and critical mineral supply chain solutions
- Best-in-class innovation capabilities with a leading U.S. based advanced materials R&D team supported by the world class University of Utah metallurgical engineering department
- The potential to extend the research and development activities of the HAMR technology to rare earth metals, zirconium metals and other strategic metal powders
- Ownership of an operational pilot titanium production facility in Utah, USA, that can upgrade titanium minerals, produce titanium metal and produce titanium spherical powders

Hyperion Metals Ltd
ABN: 84 618 935 372
hyperionmetals.us

U.S. Head Office
129 W Trade Street, Suite 1405
Charlotte, NC 28202

More Information
info@hyperionmetals.us
+1 704 461 8000

- Security and control over the patented Blacksand technologies, being the exclusive commercial licensing rights for more than 40 global patents focused on advanced metal production technologies
- The benefit of over 8 years of research and development, with approximately US$12m of funding invested to date, including over US$7m from U.S. government agencies including ARPA-E/DOE, EERE/DOE, NSF, and NAVAIR/DOD
- Life of technology cost benefits through a significantly reduced royalty rate on titanium sales

Key Terms

The key terms of the Option Agreement include:

- The exclusive option to purchase 100% of the ownership interests in Blacksand, valid until up to 31 December 2022 in exchange for US$250,000 cash
- Upon exercise, Hyperion will pay Blacksand consideration of US$12,000,000, with up to 30% payable in Hyperion shares
- Upon exercise, Hyperion will establish an endowed chair professorship at the University of Utah, that will be used to support research and development of advanced low carbon materials using Hyperion's technologies. Total R&D investment with the University of Utah will be US$1,000,000 over a three year period.
- Payment of a 0.5% royalty upon cumulative net sales in excess of US$300,000,000

Anastasios (Taso) Arima, CEO and Managing Director said:

"*The potential market size for a low carbon, lightweight, strong, heat resistant, corrosion free metal that can be 100% recycled is more than $270bn pa. That metal should be titanium.*

Titanium is a superior metal and has only been held back from widespread adoption by high cost.

The patented technologies developed by Dr Fang and the Blacksand team can produce aerospace grade titanium metal and powders at significantly lower costs with minimal carbon emissions.

The combination of Hyperion and Blacksand Technology is transformational, bringing together two highly complementary organizations, supported by the world class metallurgical engineering department at the University of Utah, to create a leader in sustainable low carbon titanium metal and powders. Hyperion's Titan Project in Tennessee will supply low carbon titanium mineral feedstock to produce low carbon, low-cost titanium metal and powders using the HAMR and GSD technologies.

We aim to build on Blacksand's strengths in material science and innovation to scale and commercialize these breakthrough American technologies and make the US, once again, the leader in titanium metal."

Dr. Z. Zak Fang, Professor of the University of Utah and founder of Blacksand Technology LLC, said:

"*Blacksand is excited about the prospects of commercializing its suite of titanium technologies through Hyperion Metals. Hyperion recognizes the potential of the breakthrough HAMR process based on a simple and elegant scientific principle to lead the titanium production industry away from the old, energy intensive, and environmentally challenging Kroll process. This is a historical opportunity to change how Titanium is made with an energy-efficient, potentially zero-emission, and low-cost technology.*"

Dr. Michael Simpson, Chair of Materials Science & Engineering at the University of Utah said:

"The Department of Materials Science & Engineering of the University of Utah is excited and honored to partner with Hyperion Metals on education of undergraduate and graduate students majoring in both metallurgical engineering and materials science and engineering to progress research and development of Hyperion's metal technologies.

Hyperion's support in the form of scholarships, internships and an ESG legacy endowment will be of significant benefit to our current students as well as supporting future research. The research funding will enable the application of our world class metallurgical engineering resources to performing exciting research on high end metals production related to Hyperion's patented technologies.

We are very appreciative of Hyperion Metal's generosity and trust in our department and are excited about the long-term partnership."

This announcement has been authorized for release by the Board.

For further information and enquiries please contact:

info@hyperionmetals.us
+1 704 461 8000

Blacksand Technology Overview

Blacksand Technology, LLC ("Blacksand") is a materials innovation company founded in 2013 by Dr. Z. Zak Fang, Professor of Materials Science and Engineering of the University of Utah.

Blacksand has developed proprietary and patented technologies to produce low cost, low-to-zero carbon spherical and non-spherical titanium and its alloys, stainless-steel powders, and refractory metal alloy powders.

Core competencies of Blacksand include expertise on metallic materials manufacturing processes, especially metal powders synthesis, characterization, processing, sintering, and mechanical properties. Blacksand expertise covers titanium, refractory metals, hard materials, and other specialty alloys.

Blacksand Acquisition

Hyperion has entered into an agreement for the option to acquire Blacksand up until 31 December 2022 ("Option Agreement").

The acquisition of Blacksand establishes a clear market leader in advanced titanium technologies that offer low cost, low carbon titanium metal and powders from sustainable all-American recycled metal and critical minerals supply chains.

Blacksand holds the exclusive commercial licensing rights for more than forty global patents through a license agreement with the University of Utah ("License Agreement"), including the global patents for the breakthrough HAMR and GSD technologies that can produce low cost and low carbon titanium metal.

The License Agreement grants Blacksand a royalty-bearing exclusive license to commercialize the intellectual property that Blacksand developed in conjunction with the University of Utah. The License Agreement automatically continues unless one of the parties terminates. Hyperion will be able to apply this patent and technology platform across a wider range of advanced metal alloys and powders for markets including space, aerospace, electric vehicles and 3D printing.

Hyperion will have best-in-class innovation capabilities with a world leading advanced materials research and development team, including Dr. Zak Fang, Dr. Kesh Keshavan and Dr. Pei Sun, to fully capture the opportunities in low carbon advanced metals.

The acquisition provides life of technology cost benefits through a significantly reduced royalty rate from ~5% of revenue, to 0.5% on cumulative net sales greater than US$300,000,000.

Hyperion will establish an endowed chair professorship at the University of Utah, used to support research and development, including funding research grants, scholarships and internships directly related to the advancement of Hyperion's patented technologies. The collaboration with the University of Utah provides Hyperion with access to significant R&D resources and personnel from a world class metallurgical engineering department.

Blacksand owns an operational titanium metal and powders production facility, located in a leased building in Salt Lake City, Utah currently producing material amounts of product for qualification of commercial applications with prospective customers, as well as an advanced materials research and development laboratory that has a track record of successfully progressing research into commercial development.

Hyperion intends to significantly increase production of titanium metals powders at Blacksand's pilot production facility. Economic and engineering studies are underway to evaluate an expansion of the current operational plant - that can produce titanium metals powders from either titanium scrap metal or titanium ore feedstocks - to pre-production scale.

Core Patented Technologies: HAMR & GSD

A technical challenge in titanium metal production is the difficulty in removing oxygen from titanium feedstocks, including scrap metal and titanium ores, and the subsequent propensity of purified titanium metal to rapidly pick-up oxygen and other impurities.

The current standard technology, the Kroll process, addresses these challenges via converting titanium ore (an oxide) into titanium tetrachloride ($TiCl_4$), and then reducing the chloride to titanium metal with magnesium. Unfortunately, this technology is both capital, energy, and carbon intensive.

Figure 1: Current titanium metal manufacturing process diagram.

The breakthrough ***hydrogen assisted magnesiothermic reduction ("HAMR")*** technology is a low cost, low-to-zero carbon titanium powder production process invented by Dr. Z. Zak Fang and his team at Blacksand.

The HAMR technology utilizes hydrogen to destabilize Ti-O, making it possible to turn the reduction of TiO_2 with magnesium from thermodynamically impossible to thermodynamically favored. This allows TiO_2 to be reduced and deoxygenated directly by magnesium to form TiH_2, with low oxygen levels that can meet the needs of the industry. TiH_2 can be further processed to titanium metal through standard industry methods. The breakthrough HAMR process reduces the energy intensity and resulting carbon emissions and cost of producing titanium metals.

The ***granulation-sintering-deoxygenation ("GSD")*** process applies the HAMR technology to a simple process that can produce spherical titanium powders which can then be used in 3D printing and additive manufacturing. The GSD manufacturing process steps are:

1. Titanium metal or alloy is hydrogenated to make friable hydride and is then milled into fine particles
2. The particles are granulated into spherical granules in the desired size range using spray-drying
3. The spherical granules are sintered to produce densified spherical titanium powder
4. The densified spherical titanium powder is deoxygenated with magnesium to reduce the oxygen content to product specifications

GSD significantly improves the yield of metal powders, by over 50% from traditional gas and plasma atomization techniques and produces a spherical powder with low oxygen, controllable particle size and excellent flowability.

Importantly, with these technologies the source material can be recycled titanium scrap material. The manufacturing of titanium components and structures can generate a large amount of titanium machining chips (this 'scrap 'can be over 90% for complex traditionally milled parts). This scrap titanium can be sorted, cleaned, and prepared for processing as the source material in Step 1 above. Non-spherical powders can simply be produced by removing step 2. This recycling pathway for the can reduce costs and significantly improve the sustainability of titanium metal manufacturing.

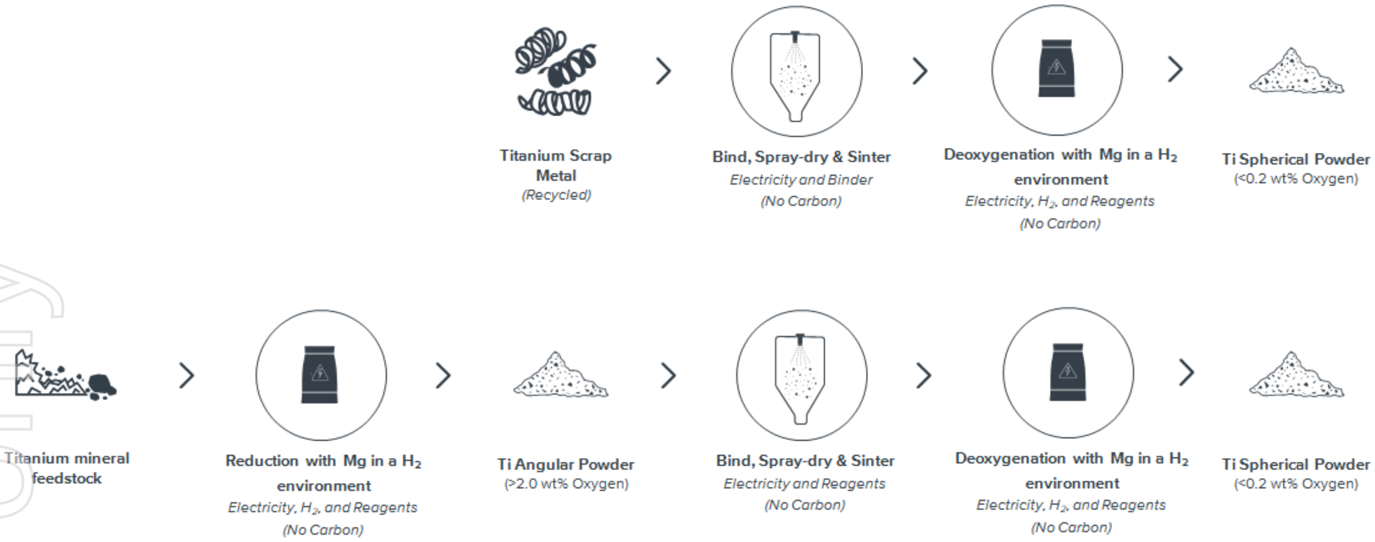

Figure 2: HAMR (+ GSD) process diagram.

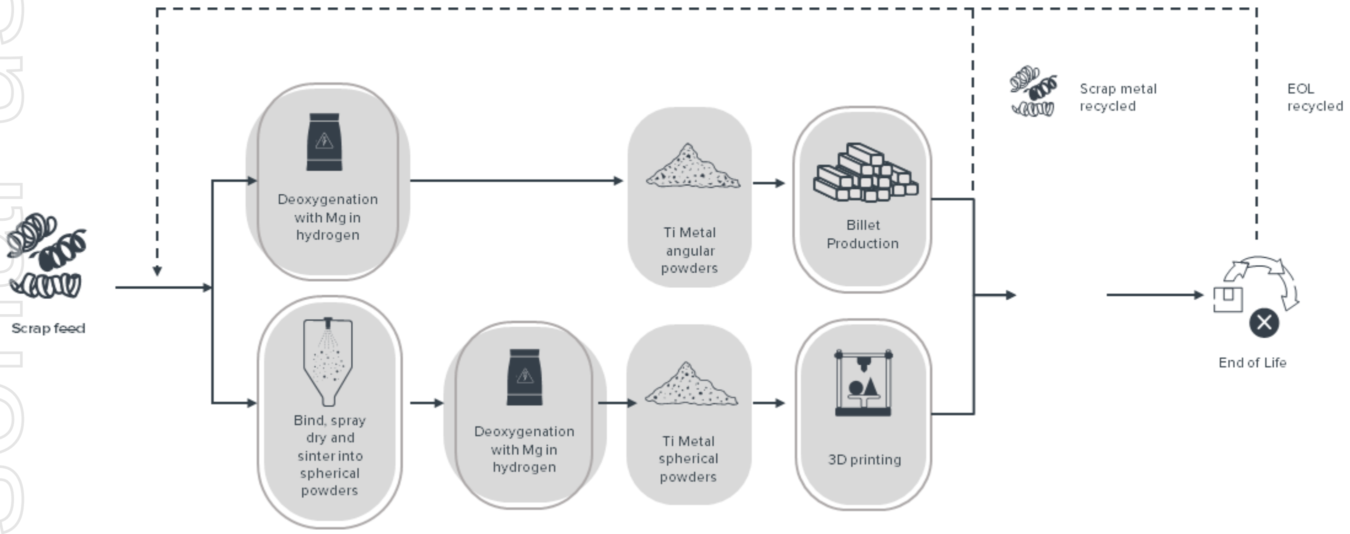

Figure 3: Potentisal for closed loop recycling using Hyperion's HAMR and GSD technologies.

Both the HAMR and GSD technology can also introduce desirable alloying ingredients. For example, titanium hydride powder can be blended with aluminum and vanadium powders to create the widely used alloy Ti-6Al-4V. Other alloying elements for titanium include Fe, Nb, Zr and Mo.

From 2014 – 2020 Dr. Fang and his team worked in collaboration with Boeing and Arconic to develop the technology to a pilot scale at the University of Utah, utilizing ~US$7 million in grant funding from ARPA-E and the Advanced Manufacturing Office ("AMO"), the Office of Energy Efficiency & Renewable Energy of the U.S. Department of Energy and the Naval Air Systems Command of the U.S. Department of Defense.

Titanium powder produced with the HAMR technology has consistently and reliably met the purity requirements defined by the industry standard. The result was the successful production and testing of the purity of the powder against the industry standard for general purpose titanium sponge (ASTM B299-13).

Weight %	Mg	Al	Fe	Si	Cl	O	N	C	H
Final HAMR Ti powder	**<0.1**	**<0.03**	**<0.10**	**<0.04**	**<0.1**	**<0.12**	**<0.02**	**<0.03**	**<0.03**
ASTM standard for Ti sponge[1]	0.5	0.05	0.15	0.04	0.2	0.15	0.02	0.03	0.03

Table 1: HAMR product quality comparison to industry standard product.

Further information on the research can be found on the University of Utah's website (https://powder.metallurgy.utah.edu/research/hamr.php) and on ARPA-E's website (https://arpa-e.energy.gov/impact-sheet/university-utah-metals).

A detailed energy-economic analysis and a full process simulation were performed to estimate the energy consumption, emissions, and cost at mass production. The modeling effort included the feed materials, reaction conditions (temperature and pressure), and pretreatment of the feed materials and post-treatment of the products. The result indicated that the HAMR process is ~50% less energy intensive and generates ~30% less emissions than the Kroll process.

Figure 4: From left to right; Anastasios Arima and Dr. Z Zak Fang, Mr. Arima with lab scale furnace, Dr. Pei Sun, Mr. Arima, Mr. Lamont Leatherman standing atop pilot scale furnace.

The majority of the energy and emissions savings come through eliminating the need to chlorinate TiO_2 to make $TiCl_4$, and vacuum distillation after the reduction of $TiCl_4$. This work is also prior to the use of titanium scrap as a feedstock, or the incorporation of any renewable energy utilization in the mining and purification step in processing of a TiO_2 feedstock; hence there is potential for further reduction in the total carbon intensity within the supply chain for HAMR titanium metal production.

[1] ASTM-B299-13 (GP Ti sponge)

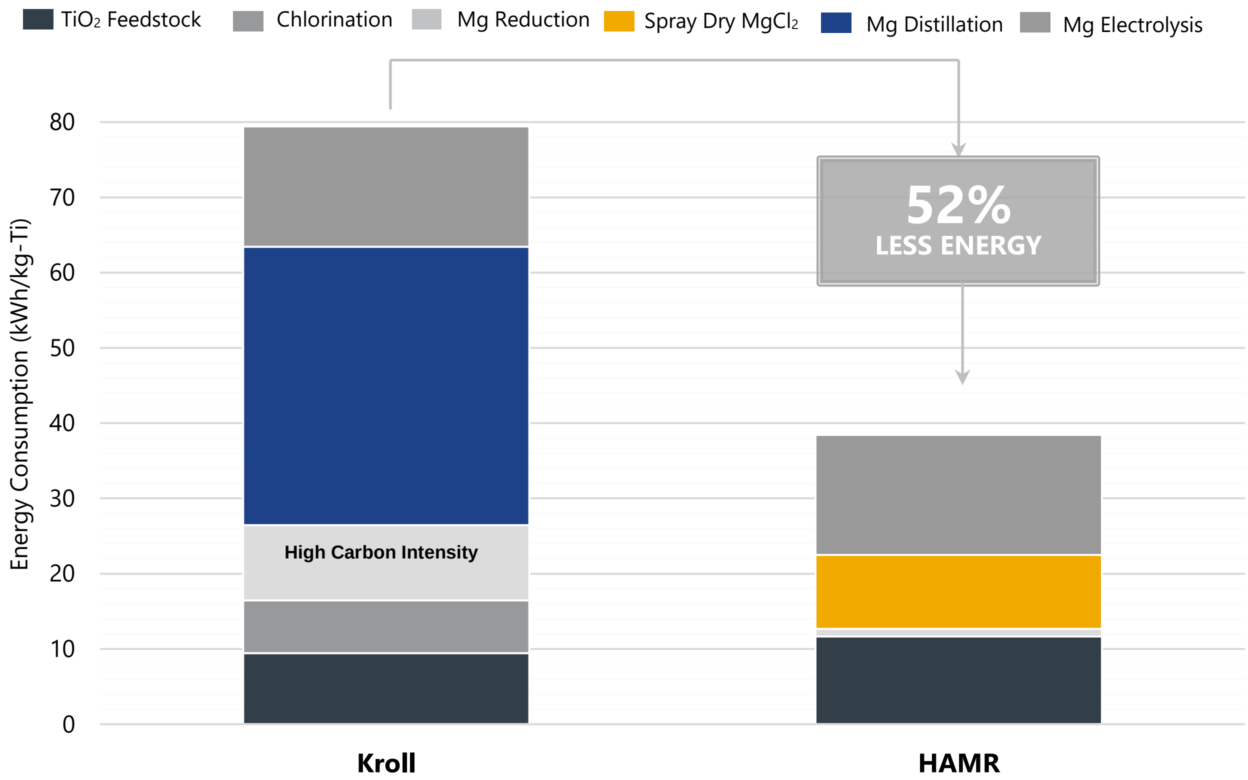

Figure 5: Energy savings analysis for the HAMR v. Kroll process.

The opportunity

The combination of the two patented technologies - GSD and HAMR - plus the advent of wide scale industrial 3D printing capabilities offers a compelling market opportunity.

The successful scale up of these technologies could potentially produce zero-carbon spherical titanium powders at a fraction of the cost, with economic modelling indicating a reduction in costs per ton of over 75%. Oak Ridge National Laboratories reports that 3D printing can cut down manufacturers' use of raw materials by up to 90%. This quantum of efficiency and cost reduction would not just disrupt the titanium market, but also the far larger aluminum and stainless steel markets.

Titanium competes with metals such as aluminum and stainless steel for strength, and corrosion resistance, and while there are several other metals with excellent properties in these applications, none have the same combined superior properties of strength, weight and corrosive resistance as titanium.

The size of the global titanium primary metal market is ~US$4.2bn pa[2]. The size of the manufactured titanium part market, which would be the relevant comparator for additive manufacturing with titanium powders, is a multiple of US$4.2bn pa. The global primary stainless steel market is ~US$115bn pa[3] and the aluminum market ~US$150bn pa[4,5].

Titanium is a superior metal for a wide range of high-performance applications in the aerospace, medical, space and defense sectors. It is only cost that has held it back from being used for its superior properties in larger consumer markets such as the global transportation industry.

The patented HAMR and GSD technologies have the potential to provide a step change in the titanium supply chain process through eliminating process stages, reducing energy consumption, reducing carbon emissions

2 Roskill Titanium Metal 10th Edition Update 1 – November 2020
3 Alcoa Corporation Investor Presentation, May 2021
4 Outokumpu, https://www.outokumpu.com/en/investors/outokumpu-as-an-investment/operating-environment
5 MEPS, https://www.meps.co.uk/gb/en/products/world-stainless-steel-prices

and significantly cutting costs. Hyperion believes these breakthrough technologies offer a pathway to create the lowest cost, lowest carbon titanium components globally.

World Leading R&D Team

Dr. Z. Zak Fang

Dr. Zak Fang currently serves as a Program Director at the Advanced Research Projects Agency-Energy (ARPA-E). His focus at ARPA-E is on advanced materials and manufacturing technologies for energy production, storage, and efficiency applications.

Prior to joining ARPA-E, Fang served as a Professor in Metallurgical Engineering at the University of Utah. There, he led a number of innovative research projects and was recognized with an R&D 100 Award for his efforts. He is also a serial inventor and entrepreneur. He has founded two small technology businesses and is the sole or co-inventor on more than 50 U.S. patents. Prior to joining the faculty at the University of Utah, he held various technical and management positions in a number of industrial corporations, including Smith International.

Dr Fang earned a B.S. and M.S. in Materials Science and Engineering from the University of Science and Technology Beijing and a PhD in Materials Science and Engineering from the University of Alabama at Birmingham. He is also a Fellow of the National Academy of Inventors, ASM International, and APMI International.

Further information for Dr. Fang can be found at the University of Utah's website: (https://faculty.utah.edu/u0320607-ZHIGANG_ZAK_FANG/hm/index.hml)

Dr. Fang is the founder and Chief Technology Officer of Blacksand Technologies, LLC.

Dr. Kesh Keshavan

Dr. Kesh Keshavan, PhD, is a pre-eminent materials scientist with a background in industry and a track record of inventing and commercializing new technologies. Dr. Keshavan holds 200 patents and is the recipient of "Most Cited Author; The Institute for Scientific Information".

Dr. Keshavan is currently the President of Blacksand Technology LLC and the Director of Development for SuperMetalix, Inc., an R&D company that created and commercialized the synthetic superhard material Tetride, a tungsten boride composite 10x harder than steel. Dr Keshavan previously served as a Director, Materials Engineering for Smith Bits (a Schlumberger company); Technology Advisor for Schlumberger's Drilling Group; Vice President for the Advanced Materials Group at SII Mega Diamond and Vice President for GeoDiamond Engineering & Manufacturing.

He earned a Bachelor of Science degree from Bangalore University, a B.S. in Metallurgy from the Indian Institute of Science, and a Master's and PhD in Materials Science from the University of Kentucky.

Dr. Pei Sun

Dr. Pei Sun is a metallurgical engineer and co-inventor of the HAMR technology for making low-to-zero carbon primary titanium metal, the GSD technology for producing spherical titanium powder for 3D printing, and the HSPT technology for manufacturing high-performance titanium parts.

His expertise is in the synthesis of metal powders and advanced materials manufactured from metal powders. He holds five patents covering titanium metal and powder metallurgy, has co-authored more than 30 journal papers and 2 book chapters with more than 1,000 citations. Dr. Sun joined Blacksand Technology in 2018 to assist with commercialization of their titanium-related technologies.

Dr. Sun is the Research and Technology Director at Blacksand Technology LLC and a Research Assistant Professor of Metallurgical Engineering at the University of Utah.

He earned a Bachelor of Science degree from Central South University, a Master's degree in Materials Science and Engineering from the Institute of Metal Research at the Chinese Academy of Sciences and a PhD in Metallurgical Engineering with a research project in Powder Metallurgy Titanium by Hydrogen Sintering and Phase Transformation (HSPT) from the University of Utah.

U.S. Titanium Market

Titanium is desired by industry for its light weight, high strength to weight ratio, stiffness, fatigue strength and fracture toughness, excellent corrosion resistance, and the retention of mechanical properties at elevated temperatures.

Titanium and titanium alloys are used in diverse areas such as high-performance space, aerospace, defense, automotive components, chemical processing equipment and medical implants. However, a barrier for the widespread use of titanium is the cost associated with manufacturing a finished part, with approximately half of the cost historically associated with fabrication. Additionally, the use of titanium powder to print 3D parts has been a recent technological breakthrough, allowing the production of parts, including automobiles and aerospace frames and engines, with minimal waste and material loss, resulting in significantly less energy consumption and emissions.

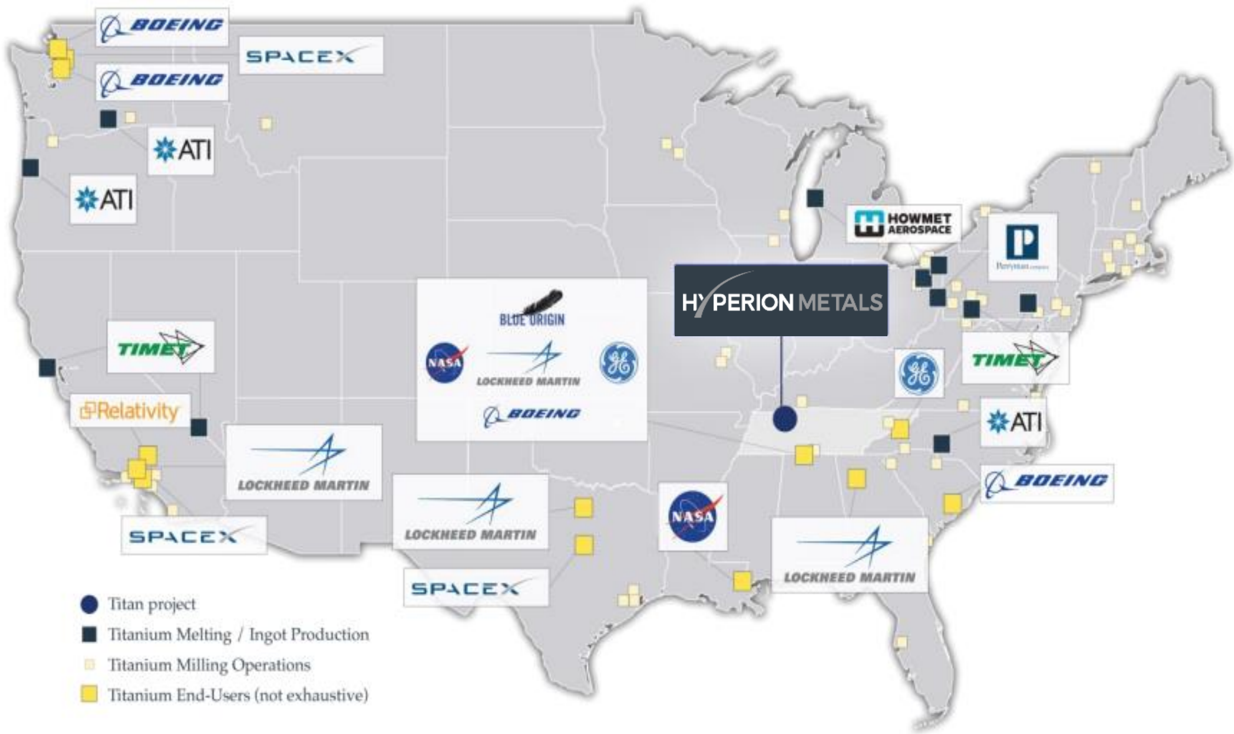

Figure 6: Titanium ingot producers and major U.S. aeronautic and space manufacturing facilities.

The U.S. market is one of the largest and highest value titanium markets globally due to the significant use of titanium in the high-performance space, aerospace and defense sectors. There is no current titanium sponge production capacity in the U.S. – titanium sponge is the first metal product in the process of converting TiO_2 minerals to titanium metal. The last U.S. domestic titanium sponge plant closed in 2020 in Henderson, NV and as of 2021 the U.S. will be 100% reliant on titanium sponge imports.

Current global titanium sponge capacity is ~328ktpa, centered in China (162ktpa), Japan (65ktpa), Russia (47ktpa), Kazakhstan (26ktpa) and Ukraine (12ktpa).

Appendix I: Key Terms of the Agreement

- In February and June 2021 the Company entered into research agreements to investigate the scale up and commercialization of Blacksand's HAMR and GSD patented technologies for the processing of titanium ore or feedstock and the production of titanium metal or alloy products ("Research Agreements"). The Research Agreements also provided the Company with an option to enter into license agreements with Blacksand over a suite of patents, including the HAMR and GSD patented technologies and related products, to be applied to certain applications. For further details, refer to the Company's ASX announcements dated 15 February 2021 and 10 June 2021.

- Hyperion has now entered into an irrevocable option agreement ("Option Agreement") with Blacksand to purchase 100% of the membership interests of Blacksand. The existing Research Agreements will continue, however should the Company exercise its option under the Option Agreement and purchase Blacksand, the Research Agreements will terminate. The cost of the option is US$250,000.

- The option period terminates upon the earliest to occur of (i) the closing of the purchase of Blacksand, (ii) termination of the existing Research Agreement (refer to ASX announcements dated 15 February 2021 and 10 June 2021), (iii) December 31, 2022, or (iv) the termination of the Option Agreement.

- Upon exercise of the Option Agreement, Hyperion will:

  - Pay US$12,000,000 to Blacksand and its members, of which the Company can elect to pay an amount (between 22.5% to 30%) in shares of the Company (based on a share price equal to 75% of the 10-day VWAP of Hyperion shares on ASX immediately preceding the closing date, subject to a floor of A$0.85 and a ceiling of A$3.00), subject to Hyperion obtaining shareholder approval;

  - Commit to invest US$1,000,000 over a 3 year period towards the establishment of an endowed chair professorship at the University of Utah, which shall be used to support research and development related to Blacksand, Hyperion, other members of the Group, and other related technologies in the field of titanium, critical metals, and minerals. In the event the endowed chair professorship has not been approved/accepted by the University of Utah within 5 years of the transaction, the committed funds shall revert back to Hyperion; and

  - Pay the Blacksand members a royalty equal to 0.5% of cumulative net sales that relate to Blacksand assets or properties above US$300,000,000.