Australian miner Talga Resources turns focus from gold to graphite

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Mark Thompson's Talga Resources plans to convert high-grade graphite from Sweden into a material called graphene, which is stronger than steel, conducts electricity better than copper and is so light and flexible that companies like Samsung Electronics Co are using it to develop new devices. *Photo: Evan Collis*

Mark Thompson dumped his plans for a gold mine to pursue a fortune in graphite, the same stuff used in pencils for centuries.

But he isn't so interested in old-school writing instruments. Thompson's Talga Resources plans to convert high-grade graphite from Sweden into a material called graphene, which is stronger than steel, conducts electricity better than copper and is so light and flexible that companies like Samsung Electronics Co are using it to develop new devices.

Graphene was discovered in 2004 by two British scientists who used Scotch tape to extract atom-thin layers of pure carbon from flakes of graphite, earning a Nobel prize for their work. While the market for it is still emerging, Talga's effort to profitably produce the material could open commercial uses from batteries and touch screens to smart clothing and building materials.

All Thompson knew about graphite was that people had been using it to scribble images since the 1500s.

"We're making grams a day in the lab, and if they can make tons a year, it would be a huge step forward," said Laurence Hardwick, who researches graphene for the Stephenson Institute for Renewable Energy at the University of Liverpool. "If Talga can generate the volumes that they say they can, it should provide a good opportunity to substantially produce graphene at scale."

Thompson, Talga's 49-year-old managing director and largest shareholder, caught the graphite bug at a Hong Kong mining conference in 2011. Participants were celebrating the outlook for lithium used in next-generation batteries being gobbled up by manufacturers like Tesla Motors to Apple. What grabbed his attention was that the biggest component in the batteries - the graphite coating wires and anodes.

Until then, Thompson planned to develop gold and iron-ore mines. All he knew about graphite was that people had been using it to scribble images since the 1500s. But the prospect of expanded demand from electronics piqued his interest. So, less than a year after founding Talga as a small mining venture, Thompson began shifting the Australian company's focus.

"After seeing the supply chain for batteries and the growth in electric vehicles, we knew we wanted to get into graphite," said Thompson, a native of Australia who worked for two decades in the mining industry looking mostly for gold.

He studied old drilling records in Sweden to find a seam of graphite more pure that what comes from the low-cost producers in China. Perth-based Talga acquired mining rights from Teck Resources, a Canadian company that was looking for copper and gold rather than graphite.

'Freak deposit'

What Thompson found north of the Arctic Circle, near the Swedish town of Vittangi, was a vein he described as a "natural-freak deposit". The graphite is so concentrated that it can be sliced easily into blocks that are easier and cheaper to process. Supplies from China, the top producer, are extracted from ore speckled with flakes of the carbon-based material, which is extracted in a process that depends on low-cost labour.

While graphite demand is growing, there may be more potential in graphene, the strongest and lightest

material known to man. It can conduct electricity even in strands one-atom thick. Using it in lithium-ion batteries could significantly increase the charging capacity and power life, according to the University of Manchester's graphene research centre. That in turn would make more viable electronics of every kind from Apple's iPhones to Tesla's electric cars.

Creating market

Success isn't a sure thing for Talga, which hasn't been profitable yet. Thompson's plan requires that the company expand the mine and build a nearby processing plant. Then, he'll need to break into a market served by bigger suppliers, something analysts and competitors say will be very difficult.

"The biggest blockers of the graphene sector have been the cost of production and the lack of volume," said Simon Moores, managing director at Benchmark Mineral Intelligence, an industry researcher based in London. "The industry can't really get true volume consistently into the market, and this is a major problem for large purchasers."

Currently, the value of the graphene shipped each year is about $US30 million to $US50 million a year - or at least $US30,000 a ton, according to Graphene-Info, an industry researcher in Tel Aviv. The market is thinly traded, with very little publicly disclosed pricing or cost information. Thompson estimates he can produce the material for $484 a ton ($US352).

"If you're talking about something that can go straight into a battery as an anode material, I would be deeply skeptical of any claim that suggested that their cost of production could be less than $US500 per ton," said Jamie Deith, CEO of competitor Eagle Graphite, based in Canada. He declined to disclose his own costs.

Expanding output

Talga is investing $30 million in its Swedish mine and processing plant, with plans to start shipping 46,000 tons a year of graphite and 1000 tons of graphene starting in 2018. By comparison, total global supply of graphene last year was about 1000 tons, according to Graphene-Info. The US Geological Survey estimates world graphite supply at 1.19 million tons.

About two-thirds of the world's mined graphite comes from Chinese companies such as Aoyu Graphite Group, according to Industrial Minerals, a London-based industry researcher. Major producers outside China include the closely-held Tirupati Carbons & Chemicals Pvt, Eagle Graphite and a unit of Paris-based Imerys.

Even if all goes as planned at the mine, getting graphene into commercial batteries will take time, partly because those larger suppliers have built up a reputation for dependability, said Logan Goldie-Scot, an analyst at Bloomberg New Energy Finance.

"There's a certain wariness of large battery manufacturers to rely on smaller companies as suppliers," Goldie-Scot said.

More batteries

But demand is growing. Lithium-ion batteries currently consume about 80,000 tons a year of graphite, and demand may reach 250,000 tons in 2020, according to Benchmark Mineral Intelligence. As many as 12 battery factories will come onstream in the next five years, including Tesla's Gigafactory in Nevada, Daimler's 500

million-euro facility in Germany and seven in China.

"Battery-grade graphite is going through a very strong growth phase," Benchmark's Moores said. "We're seeing a scramble by big battery companies to sign long-term deals and try to get their hands on supply."

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