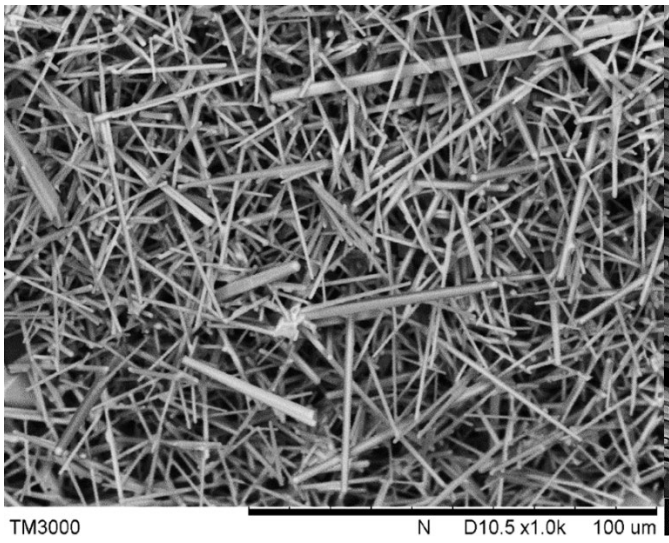
OPPORTUNITY TO INVEST

Introducing a new (possibly disruptive) technology to produce a superior fibre from topaz.

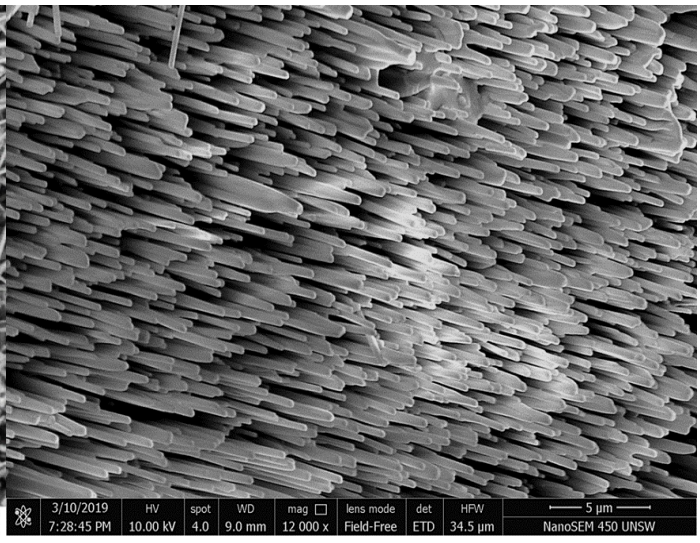
Example of Topaz crystals

Examples of Mullite Fibre Growth after propriety processing of Topaz concentrate

Unconstrained in a felted mass



Parallel free-standing single-crystals



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Introduction:

Torrington Minerals Pty Ltd (TMPL) a wholly owned subsidiary of Chase Mining Corporation Limited (CML or the Company) holds 100% of two adjoining Exploration Licences (EL 8258 and EL 8355) in northern NSW where it has undertaken advanced exploration on expansive occurrences of silexite which nominally consists of 80% quartz and 20% topaz with minor tungsten. Topaz is commonly known as a hard semi-precious stone is a silicate mineral of aluminium and fluorine with the chemical formula $Al_2SiO_4(F, OH)_2$. It is not mined anywhere for industrial mineral applications.

Previous incomplete research on Topaz concentrate produced from Torrington silexite at the University of New South Wales' School of Materials Science and Engineering under Prof. Charles C. Sorrell showed it was possible to produce mullite fibre from the Topaz. This occurs due to its unique composition resulting in the formation of a gas phase (akin to sublimation) instead of a liquid phase which most solid materials go through during 'melting'. As indicated, these mullite fibres would be the holy grail of reinforcements because:

1. They are oxides and so do not oxidise and self-destruct.
2. They are single-crystal, so they do not recrystallise and embrittle.
3. They melt at 1850°C, so they are both highly stable and more refractory than the metals and refractory metals they can reinforce to fabricate metal matrix composites (MMCs).
4. They are sufficiently stable to be mixed and fully densified with other ceramics to fabricate ceramic matrix composites (CMCs).
5. They can be compounded with Kevlar and other polymers to produce superior polymer matrix composites (PMCs).
6. They are sufficiently stable not to react with many metals
7. They are resistant to all mineral acids (except HF) and most caustic liquids.
8. They are stable in oxidising, reducing, and neutral atmospheres.
9. The processing can be engineered to modulate the length and thickness
10. The technology provides a platform to produce other ceramics that are not mined commercially owing to rarity as the topaz-to-mullite conversion occurs in the gas phase, which is unique to this system and the basis to synthesise other ceramics.

It is this potential of mullite fibres produced from Topaz that TopFibre Pty Ltd (a wholly owned subsidiary of Chase Mining Corporation Limited) has been involved in via a collaborative research programme for the past 4-years at the UNSW with co-funding assistance under a Federal Government ARC grant.

This work has achieved proof of concept that production of single crystal mullite fibre from Torrington topaz concentrate is suitable for use as a filler and reinforcing in composite materials, creating templates for metal infiltration for use in armour plating, ballistics applications and friction pads, amongst others.

Summary and status of the research completed at the UNSW:

The project work concentrated on the development of single-crystal mullite fibres because this was complex and difficult while the recovery of the released fluorine as sodium silicofluoride was relatively straightforward. Further, the work on fibre reinforcement was focussed on metal matrix composites (MMCs) as these represent a much larger market and the processing technology is less complex than for ceramic matrix composites (CMCs). However, it was recognised that there were some significant technical and commercial advantages to the fabrication of MMCs fabricated by metal infiltration of porous compacts. Consequently, the work was supplemented to investigate the feasibility of (a) fabrication of porous mullite preforms and (b) infiltration by promising metal alloys.

This work has resulted in the demonstration of proof-of-concept that Torrington Topaz derived mullite-fibre reinforced composites can be processed into MMCs using different alloys suitable for different products. These applications include the automotive, mining, chemical, and military industries. Following this work, a range of commercial trajectories became apparent. In generally matched order of commercial potential and technical simplicity (high to low):

Fibres for Laboratory Development: As single-crystal mullite fibres long have been considered the holy grail of fibre reinforcements but they are not available commercially, there are literally hundreds, if not thousands, of industrial and research laboratories that are potential customers. However, this product would require coarsening of the fibres so that they are not respirable.

Impact and Wear Pads: The transfer of minerals by the mining industry during processing results in high deterioration rates of conveyancing systems. Small MMC tiles with aluminium infiltration, even with some residual porosity, are likely to have considerable commercial potential.

Brake Pads: The replacement of existing braking systems by copper-infiltrated mullite has considerable market potential. The metal must be pure copper owing to its high thermal conductivity. However, these MMCs must be fully dense.

Military Armour: The military industry is an important potential customer as cost is less important than performance. Small MMC tiles with aluminium infiltration are ideal for body, vehicular, and possibly aircraft armour as they are lightweight and have the potential to compete technically and economically with existing armour. It is critical for these to be fully dense.

Catalytic Convertors: Although the Palladium products are established in the automotive industry, this application is attractive because no precious metal is required, thus reducing the price significantly, and the engineering is relatively straightforward as it requires only sufficient gas flow rate. There are many other chemical processes that require catalytic convertors.

Filters: The chemical industries have little choice with high-temperature high-throughput filters. Again, as this product involves only a preform, the engineering would appear to be straightforward. However, early experimentation has shown that it is not easy to engineer a controlled pore size distribution.

Synopsis: It is noted that several of the applications highlighted above will require extensive industry 'live' testing.

Although the initial goal included Pilot Plant Design and commercial studies, no work in this area was formalised partly due to COVID-19 restrictions, but also due to lack of suitable equipment availability at the UNSW. Conceptually however, the design, even for full commercial production, is straightforward owing to the present programme's exposure of the key technical issues that must be overcome.

After receiving final copies of all the research reports from Professor Sorrell and the UNSW team of researchers involved in the project and subsequent discussions with the group, the Company (CML) has internally agreed it is worthwhile to continue with the Topaz derived mullite fibre research.

Professor Sorrell has set an indicative sales price of US$1,000/kg that would be competitive with other fibres currently in use, but it would be the only (1) single-crystal fibre, which does not shrink or alter upon heating, (2) stable oxide fibre that does not recrystallise (they're all vitreous fibres on the market), and (3) mullite fibres, the holy grail of reinforcing ceramic.

Way forward:

The Company's Board, management and some larger shareholders would prefer to focus on its mineral exploration and are seeking expressions of interest to progress the TopFibre proof-of-concept outcomes with the best commercial application potential and to complete patenting thereof.

It is recommended that Interested Parties listen to a talk by Prof Sorrell on the TopFibre project at:

https://chasemining.com.au/presentations/

Or by following this link:

https://www.proactiveinvestors.com.au/companies/news/909493/chase-mining-leveraged-to-pioneering-study-on-mullite-fibre-from-topaz-at-torrington-project-909493.html

The Company's website contains a detailed section on the Torrington / TopFibre projects at:

https://chasemining.com.au/projects

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