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2 August 2017

SUCCESSFUL AUSTRALIAN RESEARCH COUNCIL FUNDING APPLICATION

TopTung Ltd (ASX: TTW) is pleased to announce that its application to the Australian Research Council (ARC) for funding of the Company's Topaz research project in collaboration with the University of New South Wales has been approved.

TopTung's wholly-owned subsidiary TopFibre (Pty) Limited has executed an ARC Linkage Project Collaborative agreement with the University of New South Wales (UNSW) and looks forward to working with the School of Materials Science and Engineering and specifically Prof. Charles C. Sorrell and Dr Pramod Koshy. The input of Dr Werner van der Merwe and Tom Dobbie of UNSW Innovations is also recognised during the contract negotiations.

The goal of the three-year research programme is to develop the means of fabricating high-value single-crystal mullite fibres from topaz sourced from TopTung's Torrington project that would be suitable for reinforcement of metal and ceramic matrix composites. This project, if successful, will also evaluate the commercial viability of producing such fibres.

The grant amount totals $340,000 and TopFibre's contribution comprises both in-kind and cash. The in-kind portion is Dr Leon Pretorius' time and supply of raw material (topaz concentrate).

Since meeting with Prof. Sorrell and Dr Koshy in November 2015, Dr Pretorius and TopTung have become involved in a number of smaller research projects at the UNSW's School of Materials Science and Engineering on potential value adding products made from the Torrington material. These include topaz, non-magnetic concentrates and clay. The total R&D cash investment by TopTung to date is approximately $60,000 without TTW's input costs. Results from this initial research were encouraging and portions may be expanded on, while the topaz related work will flow into the ARC Linkage Project.

TECHNICAL DETAILS

The topaz mineralisation at the Torrington Project is an integral constituent of the silexite which is the rock hosting the bulk of the tungsten mineralisation. Typically, the silexite consists of ~80% quartz (SiO_2) and up to 20% topaz ($Al_2SiO_4(FOH)_2$) plus a small amount of tungsten (W) and other metal compounds. It is not a sulphide mineralised system.

In appearance, the silexite varies from a relatively coarse-grained sugary textured white to cream coloured rock to a more dense darker grey to bluish coloured annealed rock. TopTung completed its initial metallurgical testwork on the former material sourced from the old Mt Everard workings. The silexite lends itself to separation and concentration of the

various components through simple water-based gravity separation processes with magnetic clean-up to remove the tungsten. Given the amount of topaz concentrate that can be produced during the processing of the silexite for tungsten recovery it is imperative to find industrial applications for the product, such as through the beneficiation research project at the UNSW under discussion here.

EXPERIMENTATION AND RESEARCH

Although the growth of mullite fibres from topaz is already known, these fibres always are intergrown and felted. The ARC Linkage project will seek to obtain separate and individual fibres, which will be the key technological breakthrough. The proposal is a variation on the commonly observed phenomenon of epitaxial growth, whereby oriented grains grow on oriented templates according to the exposed crystallographic planes of the latter. This is common practice in the fabrication of thin films and is usually carried out in a vacuum chamber using gases. This process should work for topaz since its decomposition generates a gas phase that provides the ionic components of the mullite fibres. The only difference is that the gas is produced from the decomposition of solid topaz, which is placed on the surface of the oriented template.

The ultimate goal is to produce mullite fibres from topaz with the desired diameters and lengths that are suitable as fibre reinforcement for metal matrix composites and ceramic matrix composites and to do so commercially for less than US$1,000 per kg.

PRODUCT MARKETS

The market for metal-matrix composites (MMCs) are established in structural, aerospace, automotive, electronic, thermal management, and wear-resistance applications. The market for composites, including epoxy-matrix and ceramic-matrix composites (CMCs) has only recently begun to emerge from niche applications, finding roles in space, military, ground transport, power generation, thermal protection, corrosion resistance, and wear resistance applications.

The general aim of the research programme is to develop a pathway leading to the production of commercial quantities of such individual, single-crystal, mullite fibres of dimensions suitable for implementation as reinforcements for MMCs and CMCs. Although the combined markets for these composites are in the billions of dollars per annum, it is the CMC market which will benefit most from the availability of mullite fibres.

For, and on behalf of, the Board of Directors of TopTung Limited

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