

## ILUKA BRIEFING PAPER METALYSIS

May 2015

### INTRODUCTION

On 21 February 2014, Iluka announced an investment of A\$22.5 million in the private, UK based, Metalysis Limited for an interest of 18.3 per cent. Iluka also has the right to increase its shareholding to between 20 and 24.9 per cent in the event of an Initial Public Offering.

Metalysis is developing a single stage process for the manufacture of various metals into powder form directly from ore. The initial work has focused on tantalum and titanium metals.

### RATIONALE FOR ILUKA

Iluka's investment in Metalysis is consistent with the company's stated approach to creating and delivering shareholder value by:

- acting counter cyclically;
- investing where financial merit and strategic rationale exist; and
- creating options using the balance sheet to 'place small bets'.

Iluka's investment in this potentially disruptive technology represented a relatively low investment for the size of potential shareholder value creation.

Iluka is contributing its knowledge and technical expertise to Metalysis in areas such as:

- customisation of titanium feedstock blends;
- project management and commercialisation capabilities; and
- process engineering.

Iluka is providing feedstock to Metalysis, including the potential customisation of feedstocks (including synthetic rutile) to optimise the Metalysis process. Commercialisation of the process could result in an increase in demand for Iluka's high grade chloride feedstocks.

The potential benefits for Iluka shareholders can be viewed as three-fold:

- if the technology works on a commercial scale then the investment in Metalysis will deliver significant value for shareholders as that company's value increases;
- Iluka has been granted by Metalysis a titanium metal licence as well as a right of first offer over future titanium metal powder production licenses, consistent with the licence agreement in which Iluka has a non-exclusive licence, hence the potential to be involved in downstream processing if that is seen as sensible investment for Iluka shareholders to make; and
- if the technology can be proven commercially, it introduces a new source of demand for Iluka's high grade products of rutile and synthetic rutile.

## THE METALYSIS PROCESS

Titanium metal has unique properties that include:

- the highest strength to weight rate of any metal (for example, commercial grades of titanium are as strong as common steel alloys but 45 per cent lighter);
- corrosion resistant (comparable to that of platinum);
- high melting point; and
- ductile.

Utilising these properties, the main applications of titanium metal are aeronautical components, defence armourments, sporting goods and medical equipment. Titanium metal is expensive relative to other metals and alloys and hence its use is not widespread and restricted to niche applications. Currently, titanium metal accounts for a small proportion of titanium feedstock end use (approximately 6 per cent). This market, however, is growing rapidly as use in existing applications expands and new markets evolve.

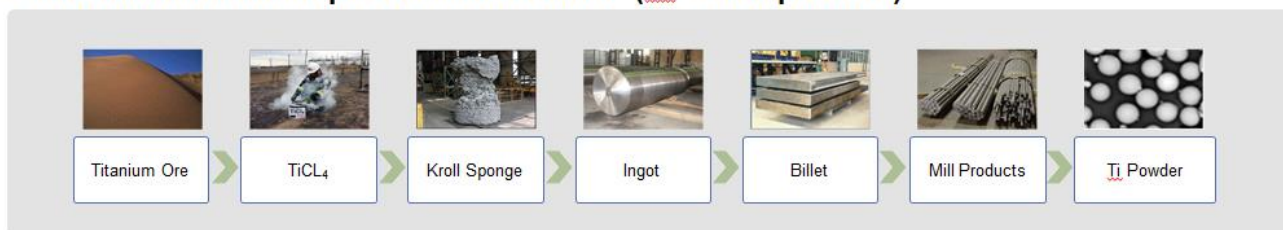
The most commonly used process to manufacture titanium metal is the Kroll process. This is a high cost, energy intensive, multi-stage process developed in the 1940s. Broadly it uses an intermediate product (titanium tetrachloride -  $TiCl_4$ ) to produce another intermediate product (titanium sponge) from which titanium metal ingots and finally titanium powder are made. There is also significant by-product material produced from the process that is unable to be reused. The lack of viable alternatives to this prohibitively expensive process has limited the volumes of metal powders used in industry.

The Metalysis process could result in material reductions in the cost of producing titanium metal and lead to significantly higher levels of use in a widening array of applications. The advantages of the Metalysis process over traditional methods include:

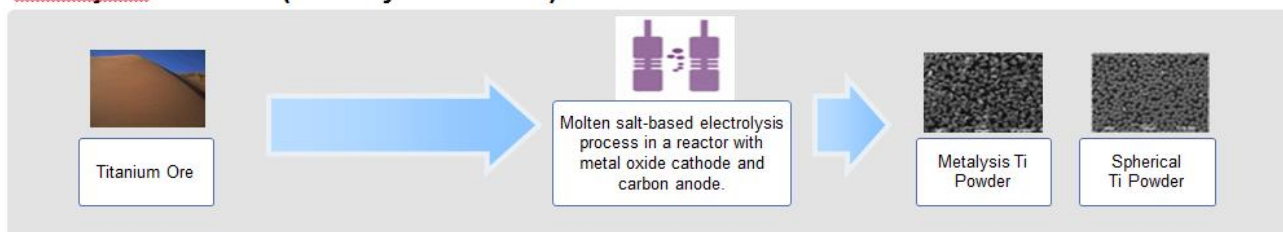
- powder direct from ore resulting in fewer processing steps;
- minimal wastage;
- lower operating costs; and
- more environmentally efficient - lower energy use, reduced emissions and no hazardous chemicals required.

Increased application of the Metalysis process would flow through to increased demand for titanium feedstocks with approximately 2.5 tonnes of rutile required for 1 tonne of Metalysis titanium powder.

### Conventional Multi-step Process to Powder (Ti – Kroll process)



### Metalysis Process (directly to Powder)

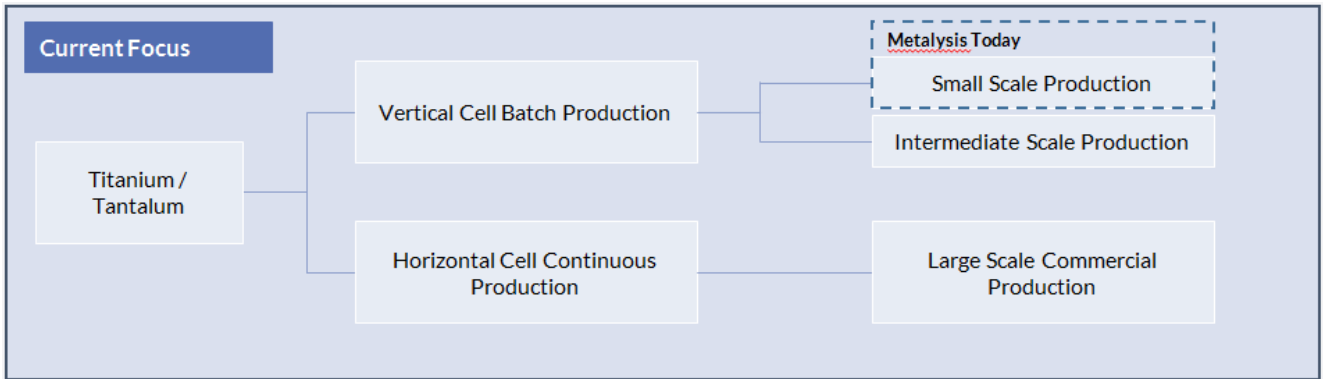


Source: Metalysis Limited

## CURRENT FOCUS

Since it was founded in 2001, Metalysis has made significant progress to date via the development of its proprietary Fray Farthing Chen (FFC) process, through to achievement of a proven process in the conversion of rutile sand directly into titanium powder.

Metalysis' current focus is upon small scale batch production (i.e. tonnes), with a clear route to large scale commercial production via a continuous process (i.e. hundreds and then thousands of tonnes), as shown in the figure below.



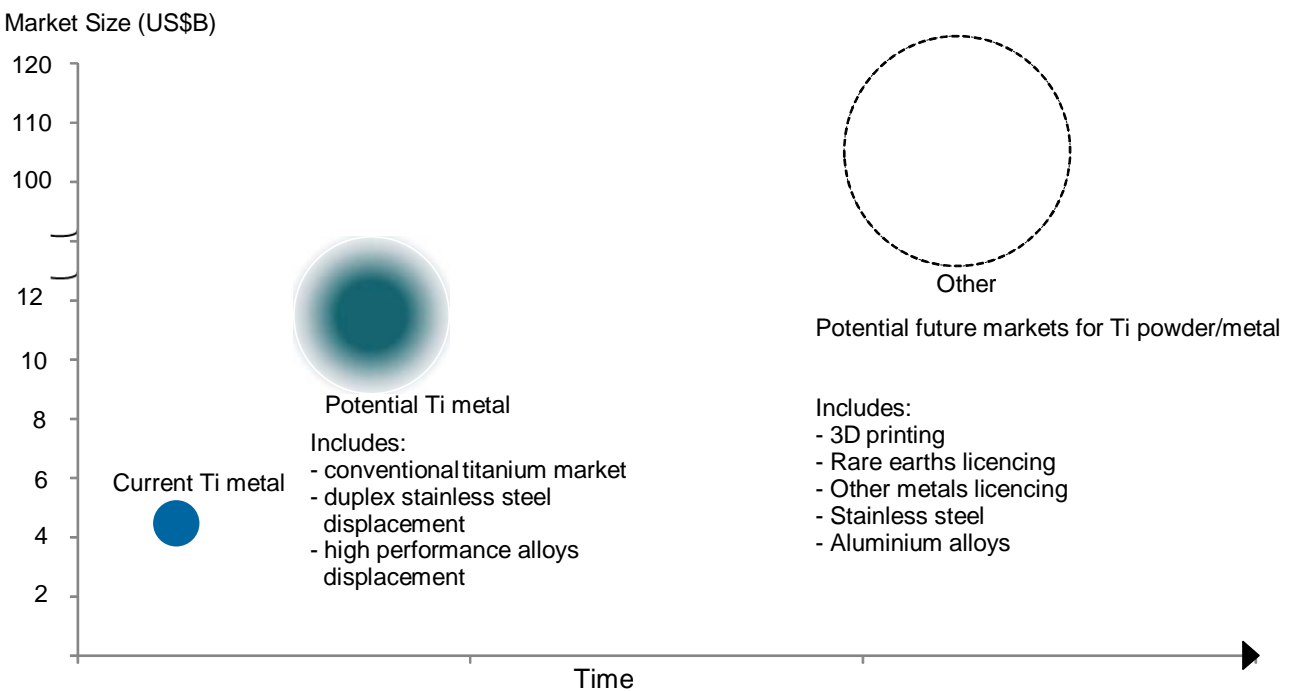
Source: Metalysis Limited

## TITANIUM METAL MARKET POTENTIAL

The continued development of a process which lowers the cost of producing titanium metal will broaden the applications in which it can be used, and generate a new growth pathway for titanium metals and alloys. It will also have a major impact on existing titanium metal end uses.

Cheaper titanium metal has the potential to compete with and displace other products such as complex steel and super alloys which currently have high production costs. The Metalysis process will also produce low cost metal powder feedstock for 3D printing, enabling significant expansion into new applications. Access to these markets would significantly increase the size of the titanium metal industry.

### Key Titanium Metal Markets – Global Significance



Source: Metalysis Limited, TZMI, Roskill, Iluka

The industry has also begun exploring the potential of this technology, for example it was recently announced that automotive and aerospace component manufacturer GKN Aerospace, are leading a GBP3.1 million collaborative research programme, in partnership with Metalysis, Phoenix Scientific Industries Ltd and the University of Leeds. The programme, called TiPOW (Titanium Powder for net-shape component manufacture) is backed by the UK's Aerospace Technology Institute (ATI) and Innovate UK, and aims to develop titanium powder specifically formulated to meet the needs of the additive manufacturing (AM) of aerospace components, and to develop techniques and equipment that will produce the powder consistently, in quantity and at a lower price than materials currently produced.

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**Competent Person's Statement**

Production potential is predominantly based on a combination of Proved and Probable Ore Reserves and Measured and Indicated Mineral Resources that have been subjected to project studies (Enhanced Production Project) using Iluka's long-term cost and pricing estimates and an assessment of risk, including access, approval and development timing. A very small portion of the production potential is based on Inferred Mineral Resources totalling approximately zero to four per cent of the production potential.

The information in this document that relates to Exploration Results, Mineral Resources or Ore Reserves is based on information compiled by Greg Jones and Chris Lee who are Members of the Australasian Institute of Mining and Metallurgy. Each of Messrs Jones and Lee is a full time employee of Iluka and has sufficient experience which is relevant to the style of mineralisation and the type of deposits under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2004 Edition of the "Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves" (JORC Code). Messrs Jones and Lee consent to the inclusion in this documentation of the matters based on their information in the form and context in which it appears.

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These forward-looking statements are subject to a range of risk factors associated, but not exclusive, with potential changes in:

- Exchange rate assumptions
- product pricing assumptions
- mine plans and/or resources
- equipment life or capability
- current or new technical challenges
- market conditions
- management decisions

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