NEOMETALS SUCCESSFULLY CONVERTS LITHIUM RESIDUE INTO VALUABLE ENGINEERED MATERIAL

Highlights

- **Neometals test-work with CSIRO confirms synthesis of commercial grade zeolite from spodumene leach residue**
- **Opportunity to add co-product revenue, reduce waste and improve the lithium hydroxide competitive cost position**
- **Technology is the subject of Neometals' Australian Provisional and International patent applications**
- **2017 global market for synthetic zeolites (molecular sieves for adsorbents and catalysts) valued at US$13.7B**
- **Engineering Cost Study underway to accelerate commercialisation activities including pilot scale test work**

Neometals Ltd (**ASX: NMT**) (**"Neometals" or the "Company"**) is pleased to announce successful conversion of leach residue into an advanced material called zeolite. This result comes from laboratory test-work conducted by CSIRO Mineral Resources ("**CSIRO**"), using a Neometals-designed process aimed at developing a saleable product and minimising waste generation and disposal costs. Having investigated the novelty of the process, the Company has filed an application for International Patent Protection, that follows an existing Australian Provisional Patent application from 2017.

Zeolites are microporous, aluminosilicate minerals commonly used as commercial adsorbents, molecular sieves and catalysts. Zeolites can be used to remove carbon dioxide (CO_2) in air purification, moisture and hydrogen sulphide (H_2S) from natural gas and in catalyst protection, amongst other things. Synthetic zeolites, like that produced by Neometals are engineered materials manufactured to tight product specifications while others are naturally-occurring, relatively low value materials. Existing synthetic zeolite production is based on combining various aluminium and silica bearing minerals that are procured at market prices.

Neometals has been actively developing processing technologies to potentially deliver favourable cost and environmental benefits in support of the company's integrated lithium production strategy. The zeolite project has been designed to support exploitation of a significant annual quantity of material that would otherwise incur handling and disposal costs.

An engineering cost study for a manufacturing facility adjacent to a lithium hydroxide plant has been awarded to M+W Group, who are completing the FEED Study for the Kalgoorlie Lithium Refinery ("**KLR**") Project (see Neometals ASX release dated 6th June 2018). Neometals will use the engineering cost study to assess the economic viability of a zeolite manufacturing process and the Company will consider a pilot scale test work program using leach residues remaining from FEED Study test work conducted in 2017/18.

Neometals Managing Director Chris Reed said "*We have been working on the zeolite synthesis project for some time and Neometals is delighted with the lab scale outcomes from its unique process flowsheet. Synthesis of commercial grade zeolite is really exciting, but equally important are the market fundamentals that support our next steps. External market studies show a large addressable market where we have what appears to be a clear competitive advantage associated with zero cost feed material. Conversion of spodumene leach residues into a saleable zeolite co-product also creates an opportunity to significantly reduce lithium production costs".*

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Background

Zeolites can't just be separated from leach residues, nor is the residue a natural zeolite. Synthetic zeolites are manufactured using aluminium and silica chemical compounds. During geological deposition of the Mt Marion Mine pegmatites, the aluminosilicate acted as a molecular sieve, trapping the lithium ions and cooling to form spodumene (lithium aluminosilicate $LiAlSi_2O_6$).

The process of converting spodumene concentrates (6% Li_2O) to lithium hydroxide (LiOH) requires approximately 7 tonnes of concentrate feed to produce 1 tonne of lithium hydroxide. In a nominal operation producing approximately 10,000tpa lithium hydroxide, circa 62,000tpa of 70,000tpa starting feed material reports to waste. The waste from the process is called 'leach residue'. Neometals has been very motivated to reduce future waste from tailings, find a high value application for its use and improve its competitive position on the lithium hydroxide cost curve. Alternative uses for leach residue are limited to applications such as road-base or cement manufacturing.

The proposed Neometals lithium hydroxide refinery is expected to produce approximately 62,000tpa residue at full capacity. Neometals estimates that conversion of the residue at the KLR could produce in excess of 100,000tpa zeolite product. Zeolite production has the potential to significantly improve the competitive position of lithium hydroxide production from spodumene.

Test-work Program

Neometals designed the process flow-sheet and commissioned CSIRO (Waterford, WA) to develop a bench scale test to produce and characterise commercial specification zeolite products from leach residues. The test-work focussed on producing a range of zeolite products that have common application in catalyst and petrochemical industries to identify the most appropriate processing route/conditions for synthesis of marketable material.

Steps undertaken in the test-work program included:

1. Flowsheet design for bench scale demonstration;
2. Equipment fabrication;
3. Test program; and
4. Analysis and Characterisation.

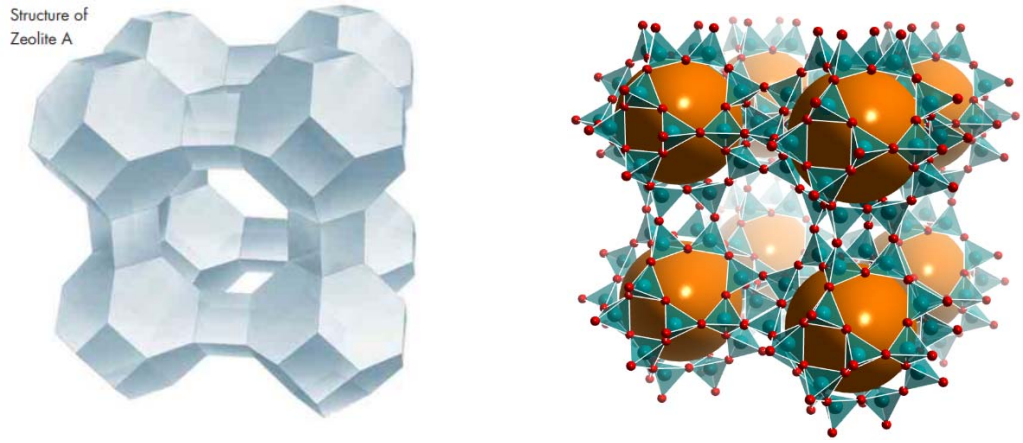
Leach residues from Mt Marion Lithium Mine concentrates were used for the test program. Details on the final process flowsheet that repeatedly produced commercial specification zeolites remain 'commercial in confidence'. The product from the test manufacturing was analysed to determine its conformance with typical product specifications for commonly-available zeolites.

Applications and Market

Zeolites are microporous, aluminosilicate minerals commonly used as commercial adsorbents, molecular sieves and catalysts. Zeolites are both naturally occurring and produced synthetically and have a very large internal surface area (~800m^2/g). They are characterised by a three-dimensional pore system (aluminium and silicon tetrahedral linked by shared oxygen atoms) with identical pores of precisely defined diameter. The void spaces (pores) can host cations, water and other molecules.

The first synthetic zeolite commercialised as an adsorbent in 1953 when Union Carbide used it to remove an oxygen impurities from gas streams. Due to specific pore sizes and large surface areas, some zeolites are used as adsorbents, molecular sieves and catalysts. Zeolites can remove water to very low partial pressures and are very effective desiccants that can remove volatile organic chemicals from air streams, separate isomers and mixtures of gases. As it relates to catalysis, the main industrial application areas are: petroleum refining, syn-fuels production, and petrochemical production. Synthetic zeolites are the most important catalysts in petrochemical refineries.

Figure 1 – Images showing the crystal structure of synthetic industrial Zeolite. Silicon atoms are teal and red atoms are oxygen. Orange spheres fill the voids of the sodalite cages. Site structure shows the large central pore with a high affinity to adsorb water and other polar molecules.



According to Markets and Markets (2017), synthetic zeolites can fetch up to circa USD$5,500 per tonne and the global market for synthetic zeolites is approximately 2.4Mtpa with a total estimated value at circa USD13.7 Billion.

Next Steps

Neometals is undertaking further product evaluation, market analysis and will secure validation from zeolite end users whilst undertaking the following next development steps:

- Engineering cost study to support economic evaluation and pilot-scale test work;
- Engineering and design of pilot plant – sufficient leach residue already available to advance to pilot scale; and
- Continued characterisation work to further end user specification evaluation.

ENDS

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About Neometals Ltd

Neometals Ltd ("Neometals" - ASX:NMT) is a developer of industrial mineral and advanced materials projects. Neometals has two key divisions – a fully integrated Lithium business and a Titanium-Vanadium development business. Both are supported by proprietary technologies that assist downstream integration through revenue enhancement and cost efficiencies.

Neometals owns a 13.8% stake in the Mt Marion lithium mine near Kalgoorlie, which operates one of the world's biggest lithium concentrators. Neometals holds an offtake option, which forms the backbone to its fully-integrated lithium business aspirations which include a Lithium Hydroxide Refinery and Lithium-ion Battery Recycling process. The 100%-owned Barrambie Titanium-Vanadium Project in WA's Mid-West is one of the world's highest-grade hard-rock titanium-vanadium deposits.

Neometals' strategy focuses on de-risking and developing long life projects with strong partners and integrating down the value chain to increase margins. The company aims to leverage its cashflows to grow opportunities that provide sustainable mineral and material solutions to customers and to return value to shareholders.