



Shaw Stockbroking

Rare Earths Research

Alkane Resources [ALK]



Recommendation: Accumulate
Price Target \$1.15

KEY VALUE DRIVERS:

- Alkane has done it right. Time invested in a pilot plant over the last 8 years for separation of zirconium, niobium and heavy rare earths from its Dubbo resource.
- Product samples have been sent to prospective end use buyers for assessment.
- A second full feasibility study to be completed by mid 2011.
- Scale of final production will be subject to this feasibility.

Vincent Pisani
Senior Research Analyst
10 December 2010

Australian Companies

Alkane Resources [ASX: ALK]

Recommendation: Accumulate. **Price Target :** \$1.15

Alkane Resources is not a new company in the area of rare earths. In fact, a mineral separation plant and associated technology has been the thrust of the company's investment thesis for the last decade on its Dubbo Zirconia Project [DZP]. The company is expected to reap the rewards of two Definitive Feasibility Studies [DFS] by June 2011 (the first being completed in 2002). Three main product streams are expected to underpin revenues by 2013, zirconium, niobium and rare earth concentrates. We like the Alkane story and will review our target price and recommendation once the second DFS is completed in 2011.

Dubbo Zirconia Project. The DZP is one of the largest heavy rare earth deposits globally with Measured Resources down to 55m [ie very shallow / low cost] of 35.7M tonnes grading 1.96% zirconium oxide, 0.46% niobium oxide, 0.14% yttrium and 0.75% rare earth oxides. The deposit is very homogeneous down to 100m with an additional 37.5M tonnes. Although the ore is not classified as a radioactive deposit, it does contain 23M lbs [10,200 tonnes] of uranium with an in-ground value of US\$1.38bn. There is enough ore for a +30 year, reliable mine life.

Location. DZP, as the name suggests, is located near Dubbo, NSW some 400km from Sydney and 30km from the regional centre of Dubbo. The project is one of the largest zirconium, yttrium and tantalum resources in the world and contains very commercial quantities of niobium and rare earths. The Project is held by Australian Zirconia Ltd (AZL), a wholly owned subsidiary of Alkane Resources Ltd, and is centred on the Toongi trachyte intrusive.

The DZP site has many infrastructure advantages with power and gas available from the state grids at Dubbo, and water accessible from the Macquarie River 10 kilometres to the north. Numerous local roads service the site from Dubbo and the nearby Newell and Mitchell Highways. The currently disused Dubbo to Molong railway passes immediately to the west and south of the site and could be reactivated to provide supply for process chemicals. The city of Dubbo with a population near 40,000 would be the source for an anticipated basic conceptual start up operating workforce of 65 to 85.

Mining: The ore will be mined by conventional open cut techniques followed by crushing and grinding.

Sulphation: Grinding is followed by low temperature sulphation roasting in 300 kg/t sulphuric acid. Cooled roaster product is leached in water and filtered to produce a stable pregnant leach solution (PLS).

Extraction: PLS is contacted with a commercially available organic solvent extractant, in commonly used solvent diluents. The zirconium is preferentially extracted, with niobium-tantalum and the yttrium-rare earths remaining with the PLS to be recovered in subsequent flow sheet steps. The zirconium is stripped from the loaded organic and precipitated by adjusting pH with the controlled addition of an alkaline reagent. The now barren organic is re-generated in two steps prior to return and re-used in the extraction stage.



Capital Structure of ALK:

Fully Paid Ordinary Shares: 249,028,158

Options (Nov 2011. 25c each):

Share Price: A\$0.85

12 month high / low: \$1.19 / \$0.23

Market Capitalisation: A\$210.4m (fully diluted)

Av. monthly volume traded: 16.5m shares

Directors

David Ian Chalmers [Managing Director]

John Stuart Ferguson Dunlop [Chairman]

Ian Jeffrey Gandel

Anthony (Tony) Lethlean

Ian Gandel

www.alkane.com.au



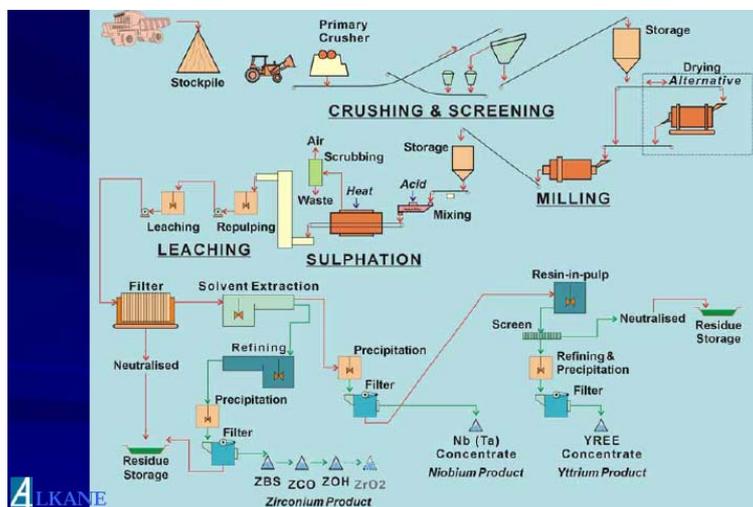
All products have successfully been separated at the company's pilot plant at ANSTO, NSW. Source: Alkane Resources

Refining: The stripping and precipitation steps have been developed to preferentially exclude minor impurity elements from the final product. Final washing in water enables a high purity (>99%) acid soluble zirconium (+hafnium) basic sulphate product (ZBS) to be produced. This product may be used directly in some applications, or as an intermediate product for further downstream production of very high tech materials. AZL has also successfully converted the ZBS to zirconium hydroxide (ZOH) in which the residual sulphate levels are exceptionally low (~0.01% S). Laboratory experimental production of zirconium carbonate (ZBC) has taken place but is not yet completed to final specifications. The production of zirconia (ZrO₂) can proceed from any of the three intermediate products but the end use of that material dictates the process parameters. All products include hafnium, which occurs naturally with zirconium and has very similar chemical properties. Niobium (and tantalum) are precipitated as an acid soluble concentrate (80% Nb₂O₅) directly from the PLS after zirconium extraction. Some residual zirconium, and light rare earth elements lanthanum and cerium, are coprecipitated but it is possible to reduce the level of rare earth impurities by subsequent leaching in weak acid if necessary.

The PLS remaining after zirconium and niobium recovery is partially neutralised and this is followed by yttrium-rare earth element extraction onto resins, using a "resin in pulp" technique. Loaded resin is washed, and the yttrium and rare earth elements stripped and subsequent precipitation results in a mixed yttrium and heavy rare earths concentrate, for downstream processing by existing specialist rare earth producers. A longer term strategy could lead to the separation of zirconium from hafnium and preparation of individual metals. Similarly the niobium could be separated from tantalum, and perhaps separation of yttrium from the rare earths. Uranium is removed from the zirconium stream, otherwise it contaminates the final products and depending upon State approvals, uranium could also be recovered to a saleable product. Thorium is similarly removed from the niobium product and could also be recovered if a market developed for this metal.



Inside Alkane's demonstration pilot plant at ANSTO. Source: Alkane Resources



DZP Conceptual Flow Sheet, Source Alkane Resources

Capital Costs of the DZP. The capital cost for the base case was estimated to be about \$150 million although that doesn't include a sulphuric acid plant which could add an additional \$20-30 million. Current thinking suggests that having an acid plant on-site may have significant longterm costs savings. If ALK went for the 1 million tonnes per annum scenario, the capital cost would probably be around \$300M and would achieve further economies of scale with operating costs savings.

Capital costs are estimated at A\$150m. If the company decides to go to full rare earth separation, a further \$250-300m may be required

Overall Mine Production. This time last year, the base case for the DZP was 200,000 tonnes per annum of ore throughput, but by the start of 2010 Alkane realised it could sell significantly more zirconium product because the market was expanding at a rapid rate. Zirconium output has always been the determining factor of the overall size of the project and Alkane decided it was appropriate to increase the base case to 400,000 tonnes per annum. That gives production of around 6,000 tonnes per annum of zirconia, 2,600 tonnes of rare earths and 2,000 tonnes of niobium concentrate.

With the dramatic changes in the rare earths industry, Alkane also started to consider the possibility of processing 1 million tonnes per annum of ore. That would equate to 6,500 tonnes per annum of rare earths, of which approximately 1,500 tonnes would be yttrium and heavy rare earths, which would probably make Alkane the biggest producer of those products outside China in the near future. The question then would be how could Alkane sell the additional zirconium products and the way to do that could be to have flexibility in the pricing structure, without impacting on the overall revenue stream. The current resource would allow ALK to produce at the base case of 400,000 tonnes per annum of ore per annum for 200 years from an open pit operation and 100 years in the expanded concept. The resource has never been an issue. The size of the project will be determined by how much product ALK can sell without impacting on the supply/demand balance.

Zirconium Production & Applications. China is a dominant player in the downstream zirconium business, producing about 90% of world output. To do that they buy zircon from countries such as South Africa and Australia which have diminishing supply. That combined with the internal demand within China, has meant the zircon market is tightening. There aren't many new zircon projects coming on-line to replace Iluka's [ASX: ILU] Western Australian operations and even the new projects such as Iluka's Murray Basin and South Australian projects won't be enough to bridge the growing demand/supply shortfall. The zircon price is now up over US\$1,000/t and ALK's consultants, TZ Minerals International, believes it will be up into the US\$1,500-1,800/t range sometime over the next 8-10 years. That should increase the price of China's downstream zirconium products and therefore ALK's zirconium products will also increase in value.

A few different scenarios are being contemplated as part of the second DFS given the strength in rare earth prices. The scenarios all centre on production rate above 400,000 tonnes of ore, up to 1.0M tpa

At an expanded rate of production, the key question management faces is how to sell non-rare earth production of zirconium and niobium given the rather small end markets for these products

Zirconium prices expected to be +US\$1,500/t long term as demand is accelerating higher with limited production outside of Iluka



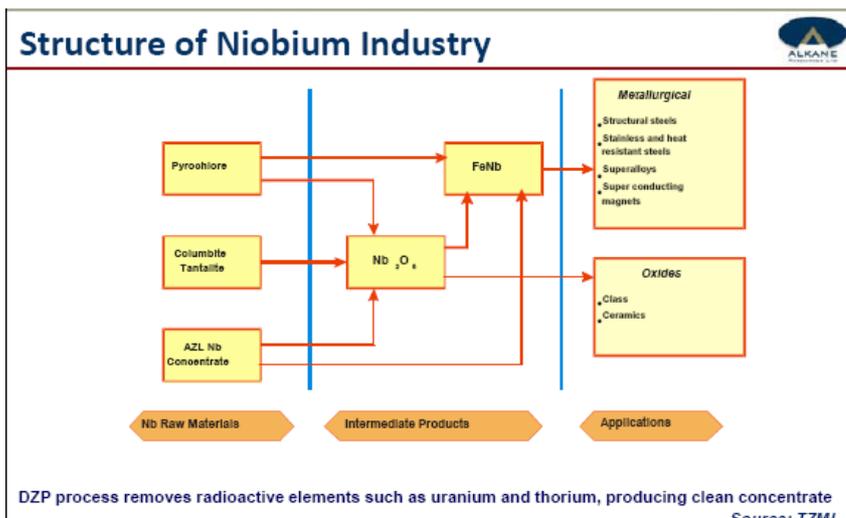
The uses for zirconium are many and centre around ceramic production, catalysts and specialist metals

Niobium Production and Applications. Niobium production is estimated at 2,000 tonnes per annum under the base case production rate of 400,000 tonnes of ore. Niobium is becoming well-known as the principal material of superconductivity. It has been used as an additive in steel for these past twenty years; in many well-known fields it is now extensively used as an industrial material. The recent large increases in niobium consumption have not come as a result of new applications. The principal markets – High-Strength Low-Alloy [HSLA] steels, stainless steels and superalloys - are essentially the same as they have been for years. Growth has come not only from the overall rise in global production of these materials, but also from the greater penetration of niobium in markets where it is already well-established and often irreplaceable. HSLA steels, by far the largest application for niobium, are widely used in automobiles, construction and natural gas pipelines. With the ongoing drive to achieve weight reduction in both the automobile and construction sectors, HSLA steels are likely to win further market share from mild steels.

Niobium is an even rarer commodity with applications in specialist steels, capacitors and superconducting magnets



The niobium industry structure is given here. It's a fairly closed industry with specialist players. We believe that ALK's end product can meet market demand on a batch basis



Source: Alkane Resources

Other Assets. ALK has a number of other assets that underpin the future of the group. Its Tomingley Gold Project in NSW and its Orange District gold properties also in NSW.

Tomingley Gold Project.

Tomingley is 24 miles from the Dubbo Zirconia Project. Three open pittable resources called Caloma, Wyoming One and Wyoming Three, were drilled to a shallow depth for a resource of 850,000 ounces of gold which includes an underground component for Wyoming One. Prefeasibility studies indicated a cash operating cost of A\$800 per ounce at a rate of 50,000 ounces per year. The study also found that substantial infrastructure costs to bring in water and power and build an underpass under a major road that cuts between the pits indicated more ore was required to justify capital costs. This led to the search for more resources with positive drilling results from beneath the floor of the proposed Caloma pit where a conceptual target of one million tonnes at 3.5 grams per tonne for 120,000 ounces was indicated.

A new ore zone was also uncovered by recent drilling 250 meters south of Caloma which assayed several +3 gram per tonne intersects where the orientation of this east west trending porphyry over 300 meters looks similar to the high grade zones in Wyoming One and Three. Detailed geological assessment indicates that Caloma may consist of several ore blocks separated by faults. A 3,500 meter rotary core drilling program to scope this zone starts this month. Positive results will lead to more drilling to prove up a resource which may lead to a mine decision before the year is out.

A Definitive Feasibility Study is nearing completion with a base case model of open pit mining of the three deposits and an underground operation at Wyoming One, with the recovery of approximately 400,000 ounces over a six to eight year period at a milling rate of 1 million tonnes per annum. At start up, an in-pit cut off grade of 1.00g/t gold would be applied through grade control to maximise the head grade to the CIL plant for the first years of operation. Lower grade stockpiled ore would be blended with Wyoming One underground ore to provide mill feed for an additional two years.

Orange District Joint Venture with Newmont

Newmont (NYSE: NEM) has earned 75% of the Molong and Moorilda Prospects from ALK. This ground partially surrounds the Newcrest Mines at Cadia that host massive resources of 44 million ounces of gold and 7.98 million tonnes of copper. Prior drilling by NEM outlined a conceptual target of 2 - 4 million ounces of gold and 50,000 - 100,000 tonnes of copper at McPhillamy's within the Moorilda Prospect.

Alkane completed an initial resource assessment of the McPhillamys deposit with the following Indicated and Inferred Resources being identified:

- 91.94M tonnes grading 1.00g/t Au and 0.07% Cu (2.96 Moz) at 0.3g/t gold cut-off; or
- 60.86 million tonnes grading 1.32g/t Au and 0.08% Cu (2.57 Moz) at 0.5g/t gold cut-off.

Further drilling and work is required before a positive decision whether or not to mine is made.



Drilling at Tomingley. Source Alkane Resources



Drilling at McPhillamys. Source Alkane Resources

Disclosures and Disclaimers

Shaw Stockbroking ABN 24 003 221 583 ('Shaw') is a participant of ASX Limited and holder of Australian financial services licence number 236048.

ANALYST CERTIFICATION

The Research Analyst who prepared this report hereby certifies that the views expressed in this document accurately reflect the analyst's personal views about the Company and its financial products.

The Research Analyst has not been, is not, and will not be receiving direct or indirect compensation for expressing the specific recommendations or views in this report. As at the date of this report the Research Analyst does not have an interest in the financial products of the Company.

DISCLAIMER

This report is published by Shaw to its clients by way of general, as opposed to personal, advice. This means it has been prepared for multiple distribution without consideration of your investment objectives, financial situation and needs ('personal circumstances'). Accordingly, the advice given is not a recommendation that a particular course of action is suitable for you and the advice is therefore not to be acted on as investment advice. You must assess whether or not the advice is appropriate for your personal circumstances before making any investment decisions. You can either make this assessment yourself, or if you require a personal recommendation, you can seek the assistance of your Shaw client advisor.

This report is provided to you on the condition that it not be copied, either in whole or in part, distributed to or disclosed to any other person. If you are not the intended recipient, you should destroy the report and advise Shaw that you have done so.

This report is published by Shaw in good faith based on the facts known to it at the time of its preparation and does not purport to contain all relevant information with respect to the financial products to which it relates. Although the report is based on information obtained from sources believed to be reliable, Shaw does not make any representation or warranty that it is accurate, complete or up to date and Shaw accepts no obligation to correct or update the information or opinions in it.

If you rely on this report, you do so at your own risk. Any projections are estimates only and may not be realised in the future. Except to the extent that liability under any law cannot be excluded, Shaw disclaims liability for all loss or damage arising as a result of any opinion, advice, recommendation, representation or information expressly or impliedly published in or in relation to this report notwithstanding any error or omission including negligence.

DISCLOSURE

Shaw will charge commission in relation to client transactions in Financial Products and Shaw client advisers will receive a share of that commission. Shaw, its associates and their respective officers and employees may in the future earn fees and commission from dealing in the subject company's Financial Products.