

# OZEQUITIES NEWSLETTER

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## ***FEATURE***

### **Week's Special**

**AJX: ALEXIUM'S COATINGS TECHNOLOGY IS FIRE AND WATER PROOF, NON STICK, ENERGY EFFICIENT AND ENVIRONMENTALLY FRIENDLY - IT IS LOW COST AND UNIQUE IN ITS MULTI-APPLICATIONS CAPABILITY**

**By Jenny Prabhu and Gerald Stanley**

Alexium International Group Ltd listed in the shell of ETW (formerly Evans & Tate) in December 2009. Alexium was formed in 2006 to commercialise the technology that resulted from a \$US 30 Million R&D program for Reactive Surface Technology (RST) under the US Department of Defence headed by Dr Jeff Owen..

The Alexium technology makes it possible to modify the surfaces of variable materials - and originally was focused on saving lives in battle, in dangerous environments or extreme weather conditions as well as extending equipment life.

It is one of several world leading technologies including LED's, carbon fibre and jet engines that have emanated from R&D that began within defence industries. Alexium's RST technology has awesome capabilities to improve life in an enormous number of ways - cheaply and in a more environmentally benign manner than any other high performance coating technology so far.

The opportunity for Australians to invest in this unique technology is due almost entirely to the connections and entrepreneurship of Gavin Rezos, who was earlier instrumental in bringing pSivida to Australia (now listed primarily in the US with a secondary listing in Australia - trading at over \$4 and well on the way to commercialisation and royalties) - and who has since then seed funded several other companies..

### *The marvellous and varied properties of modern advanced coatings*

While coatings were once just paint applied to preserve wood and metal from the ravages of weather, and expected to be renewed from time to time, today paints and other coatings have amazing properties - there are paints that are fire resistant, paints that are non stick and so soil-proof, paints for under water surfaces, paints that conduct sound, paints that conduct heat, photovoltaic paints, paints that can change from transparent to opaque, paints that repair concrete, paints that are acid resistant coatings, paints with thermal insulation properties, anti microbial paints. Much of this advance in coatings technology is due to nanotechnology - and new products are constantly evolving. A look at the "SpecialChem" trade magazine web page on Google reveals ongoing reports, on R&D, patents being granted and new commercial products evolving in coatings for all manner of purposes and for multi- purposes.

### *But Alexium's Reactive Surface Technology is a unique technology*

Alexium's Reactive Surface Technology (RST) process on coatings and paints for a range of different surfaces, is undertaken in seconds with low energy microwave compared to conventional waterproofing or oil proofing technologies. It uses environmentally friendly chemicals, less water than conventional technologies and can be applied to a range of surfaces, including textiles, glass, wood and metal oxides.

It is multi function - in the same process RST can waterproof, add flame retardance, anti microbial and non stick capabilities.

At a presentation given to the Fiber Society's Fall 2008 Annual Meeting and Technical Conference in Montreal, Quebec, Canada (1-3 October 2008), the US Air Force demonstrated the synthesis of a standard 50/50 cotton/polyamide fabric that was self-extinguishing when burned, superhydrophobic (contact angle greater than

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150°), oleophobic, reactive to chemical warfare agents and machine-washable. All this functionality was imparted to the fabric in a single treatment requiring only a 30 second cure in a conventional microwave oven operating at the 50% power setting.

This is the Reactive Surface Technology (RST) now assigned exclusively to Alexium.

Paint appears to be a major application of this platform technology, and Alexium is currently in discussing applications with multi national paint companies in addition to its current fully funded Chemical Agent Resistant Coating (CARC) program with the US DoD involving extreme testing on 2 aircraft, a ship and vehicles using paint with an Alexium coating additive.

However, Alexium has also identified initial products and revenues from specialist textile applications - from performance clothing to upholstery and to high performance filters. Emergency services, outdoor wear and sportswear are likely to be high focus areas for the technology, and Alexium is currently talking to major textile brands.

The technology also has applications in paints for aircraft to prevent ice accumulation, anti fouling paints (without biocides) for ships as well as for coating glass for self cleaning, anti graffiti paints and in other building applications.

Alexium was awarded "World's Best Technology 2009" ahead of 90 other short listed finalists from 27 US States and 11 countries from a wide range of industries.

The USAF and Dr Owens have assigned all rights in the technology to Alexium exclusively. Alexium will pay a royalty of 2.5% to the USAF for US sales and Alexium will pay a 5% royalty to Dr Owens for sales outside the US. Alexium also owns directly subsequent patents granted in Great Britain.

The services of Dr Owens and his team together with US Department of Defence (DOD) research and development facilities are available to Alexium under a Collaborative Research and Development Agreement (CRADA). There are 16 full time and around 50 part time scientists and technicians working on applications of the RST technology. Alexium has the right to patent any new applications developed under the CRADA. The CEO of Alexium, Stephen Ribich has relocated to the US where Stefan Susta is already based as Vice President of US Business Operations. John Almond will remain in London to spearhead European business development. Gavin Rezos is the Chairman.

Revenues are expected this year from both the defence industry and emergency services as well as upfront licence or evaluation payments for commercial textile and paint applications.

*Socially Responsible Investment compliant*

Dr Eva Reuter European Investor Relations in a report dated May 2010 in "Socially Responsible Investment" said, "Australian listed company Alexium International Group Ltd .. owns the "Reactive Surface Technology" which makes it possible to modify the properties of surfaces of variable materials .. Reports from the company state that this technology is particularly environmentally friendly as no heat, little power and less water are required. The solvents are very harmless and produce very little waste. Alexium is listed on the Stock Exchange in Sydney and is traded on the stock exchange in Berlin".

## **ALEXIUM INTERNATIONAL GROUP LTD - A SNAPSHOT**

Alexium International Group Ltd listed in the shell of ETW Ltd (formerly Evans & Tate) in December 2009 after ETW acquired Alexium on a 100% scrip basis with 50% of this consideration being payable on Alexium achieving

certain milestones, relating to significant revenues and multi national or specialist industry company licensing agreements

As a component of the acquisition ETW raised \$4.5 million, including a placement at 20c a share and then changed its name to Alexium International Group Ltd.

### *The technology*

Reactive Surface Technology (RST) is the culmination of several years of research by Dr Jeff Owens and his team at the US Air Force Research Laboratories, Tyndall, Florida, USA. Working as part of a research program, the team's initial challenge was to develop a means to bond both antimicrobials and a selection of potentially life-saving chemical agent reactive compounds to soldiers' uniforms. These grafts had to be strong enough to maintain their integrity, even after repeated laundering and punishing treatment as a result of their use in a wide range of weather conditions and terrains.

Given the potential diversity of applications for military uniforms and equipment, any process employed had to be simple and scalable, and to be adaptable for use on textile products including uniforms, tents, sleeping bags and even high-efficiency particulate air (HEPA) filters.

RST technology is the result of a union of two different scientific disciplines, physics and chemistry. The basis of the process is silane chemistry, where organofunctional silanes contain both organic and inorganic reactivity in the same molecule. Initially, in the 1940s, silanes were used to improve the performance and durability of early fibre glass composites. Now, however, they are used extensively as coupling agents, adding functionality to thousands of products including textiles, tyres, paints and printing inks.

In the RST process, the reactivity of these silanes is achieved not by heat curing, but rather by the use of microwave radiation. This novel approach results in:

- \* a reaction producing a more stable graft of the function on the material; and
- \* the preservation of sensitive functional groups after the treatment.

The process has been tested extensively on almost every textile—ranging from wool, cotton, leather and cellulose fibres through to a wide range of synthetics, including aramids and polyester. It was essential for the team to understand the limits of the process and, over the past twelve months, Owens' laboratory has been steadily filling with the widest range of textiles received from all over the world, each for testing with the treatment.

### *Creating New Properties*

With the initial focus on antimicrobial compounds, the technology was tested on most existing and developmental agents of this type, to check that the process did not inhibit their functionality. Extensive testing with these materials, both before and after treatment, threw up some interesting results. It was noticed that these materials exhibited different physical and chemical properties when treated with the microwave, compared with ones that were attached using heat curing. This can result in better performance of the antimicrobial and in some cases even new functionality.

Tests on textiles involved passive and persistent treatments. One antimicrobial group in particular, the chloramides, when attached with the RST technology, out-performed all existing and developmental antimicrobials. In extensive trials conducted at three separate military laboratories, chloramides were shown to be effective not only against gram positive and gram negative bacteria, but also viruses and, most importantly, anthrax spores.

Grafting chloramides to textiles and subsequently chlorinating them with a dilute hypochlorite solution produced a reactive textile with broad spectrum antimicrobial properties that was particularly effective against spores. Even more interestingly, the chloramide-treated could be periodically and repeatedly regenerated by adding a tiny quantity of bleach during the final rinse in the laundry process.

That the technology lends itself to the grafting of multiple functions for demanding applications has been successfully demonstrated. It has the ability to attach several types of chemical agents and antimicrobial compounds on the same surface simultaneously, and in a matter of just seconds, to create tailor-made solutions.

#### *Development and Commercialization*

The RST platform technology is now at the centre of three fully funded major US military development programs headed by Owens and his team:

- \* the next generation chemical/biological uniform ensemble;
- \* a Department of Defense (DoD) initiative for the fire and emergency services; and
- \* a project to develop chemical agent resistant coatings (CARC), not only for textiles, but also for other surfaces such as coatings, paint and glass.

Extensive toxicity trials in the USA have now been successfully completed for the chloramide-treated materials. Given that the RST technology can be used to apply this antimicrobial to bedding, hospital curtains, uniforms, patient gowns and paint surfaces, it now offers prospects for clean, germ-free environments in hospitals around the world - using a durable and environmentally friendly process.

#### *More Applications*

Over the past twelve months, Alexium and the US Air Force Research Laboratories have demonstrated the technology on a wide range of both natural and synthetic textiles. As the Alexium process involves the use of microwave radiation, as opposed to heat, it can be used with delicate textiles and more complicated synthetics such as aramids.

Grafting additional, multiple functions on performance textiles such as meta-aramids (m-aramid) can further extend their applications. Tests recently conducted by the US Air Force have demonstrated, for instance, that the technology can graft a superhydrophobic, (almost super) oleophobic and a flame retardant function to a fabric made from DuPont's m-aramid (Nomex) to produce a material that significantly outperforms an identical untreated textile in the event of a free-flowing fuel fire. With the combined flame retardant and oleophobic treatment, a 50/50 polyamide/cotton (NyCo) fabric, such as used for battle dress uniforms, exhibits the same rapid self-extinguishing performance when doused with fuel and then immediately subjected to a flame test.

Alexium has identified specialist textile applications – ranging from wound dressings to upholstery, apparel, technical textiles and high performance filters – where multiple functions can now be grafted either directly to the fabric or on nanoparticles that are simultaneously grafted to the fibres. The ability to select multiple functions and match them to the requirements of their intended uses has implications for so-called “intelligent textiles” too: functionalities can now be added to the fabric and programmed to react under the appropriate conditions.

For water proofing, it's the contact angle greater than 150° on the surface that makes fabrics repel water and self clean as well as stain resistant and - with microbicide attached - even kill off the bacteria that grow in sweat and make clothes smell. It can also be made fire retardant.

European Business Development Manager John Almond told the London Telegraph in December 2006, "When we saw the data showing the effectiveness of the chloramides, we knew that the technology had a central role to play in controlling the spread of infection in hospitals. We could find no other antimicrobial with such proven persistent effectiveness against such a wide range of spores and other pathogens."

Jeff Owens, the scientist who developed the technology told the Telegraph, "During Desert Storm most casualties were from bacterial infections rather than from accidents or friendly fire. We have treated T-shirts and underwear for soldiers who tested them for several weeks and found that they remained hygienic as the clothing was actively killing the bacteria".

Over time, the effectiveness of the coating falls as the active chemicals are knocked off, but it can be restored by soaking the material in a fresh solution of the same chemicals.

In hospitals where bacterial infections are a major problem the technology could have a huge role.

RST Flame retardance for textiles shows fire, including oil and fuel based fires self extinguish in seconds. The European Regulatory Standard for fabric to self extinguish is 1 minute.

There is a large business in itself in just adding cost effective and highly efficient fire retardant and stain resistant fabrics to the furniture industry.

(RST applied to textiles and building materials including glass, also means less cleaning, which is environmentally beneficial).

#### *The patent portfolio*

There is one granted patent, The UK Intellectual Property Office in January 2010 issued Patent No GB2431173 for the company's "method of attachment of silicon-containing compounds to a surface". Alexium holds proprietary patent applications for a process developed initially in a US DOD Laboratory which allows for the surface modification and attachment of nano particles or multiple functional groups to surfaces or substrates. Applications include textiles, paints, packaging, glass and building materials.

The US government filed the original provisional patent and holds other patent applications for the RST technology. Dr Owens owns the worldwide rights outside the US which have been assigned to Alexium for a 5% gross sales royalty.

Alexium will own exclusive rights to the RST technology in the US for a 2.5% gross sales royalty to be paid to the US Air Force.

#### *The latest developments*

**June 10 2010:** Alexium has commissioned the first RST continuous reel to reel textile finishing unit at the North Carolina State University, Raleigh, NC with technical assistance and support provided by the College of Textiles Dyeing and Finishing Laboratory at NCSU and representatives from AFRL.

The commissioning process confirmed that the Alexium, RST coatings process requires only minimal power, contrasting with the relatively energy intensive treatments typically in use within the textile industry.

Alexium is now scheduling a roll out program of unique textile finishing treatments using the RST process. These textiles are usually supplied by prospective licensees which have requested finishes for their own specific end use markets. Validation testing is undertaken at their own facilities.

**May 13 2010:** Alexium announced a new operations facility in Greenville County, South Carolina, USA. The South Carolina Department of Commerce, the Greenville Area Development Corporation and the South Carolina Research Authority (SCRA) have provided significant incentives for Alexium to establish its new technical fabric manufacturing and research and development plant in Greenville County. These incentives include State and Local property tax, corporate income tax, sales tax and job tax credits or rebates together with training incentives provided by South Carolina and Greenville County. The facility in Greer, SC is close to leading materials and chemicals industry companies and as well as paint and textile academic establishments. The facility is to be completed by end July. It is expected that up to 200 new jobs will be created over time in the Greenville county area from this facility.

**April 20 2010:** Alexium International Group Ltd announced it has been selected as one of only three candidates to provide the chemical protective suit component for the Modified Joint Fire Integrated Response Ensemble for the US Air Force Fire Emergency Services.

The JFIRE ensemble aims to enable fire fighters to respond to emergencies in a contaminated area, mitigate and survive.

The protection against chemical, biological and other potential contaminants is currently provided by an integrated (JSLIST) suit. Prospective suppliers of the modified JFIRE ensemble were set an objective of reducing the profile of

the current JSLIST suit by 50%, its weight by 20% but at the same time increasing its breathability, flexibility and mobility by up to 50%.

Following requests made in June 2009, the US Air Force received a large number of proposals from specialist textile and personal protection equipment providers from which the final three were selected.

Alexium is expected to list on the Frankfurt Xetra and Entry standard listing this year.

*The competition*

Competition is not seen as a major issue.

The RST technology can be licensed to *paint companies*, whose internal R&D efforts have to date have not produced anything similar to the RST capability.

With regard to *textile companies*, Du Pont is a competitor for aramid high performance textiles, and smaller groups such as Gore Tex for breathable water proof garments.

However, the RST technology can also treat Du Pont products and those made by other companies in the US, Japan and Europe by using a particular weave and making the product multi function (eg oil and water proof while breathable), thus creating a new product which could be marketed by Alexium.

There are companies using or developing a plasma vacuum technology to water proof, which appears superior to conventional water proofing but not to RST, as it is more energy intensive and not as easily scalable as RST. Plasma vacuum technology also does not provide multi functionality.

*Cash burn*

The company has some \$3.5 million in cash. It charges companies for samples supplied on request, and also charges the military for services. It expects to be fully funded for the next couple of years by which time revenues from the technology are expected to make Alexium cash flow positive.

Alexium has also received a significant cash boost from South Carolina as mentioned above, providing grants, tax credits and rebates over 10 years for state and local taxes, payroll taxes, rates as well as grants for equipment purchases and employment training.

No capital raisings are envisaged except in the case of a strategic investment - not seen as likely at this time.

ALEXIUM INTERNATIONAL GROUP LTD FINANCIALS

Last Traded price 12.5 cents

Listed Shares Issued: 73.17 mln

Escrowed Shares Issued: 35.3 mln (excluding performance shares of 52.5 mln.)

Escrowed Options Issued: 21.0 mln : 16 mln exercisable at 30c by February 26 2012, 2.5 mln at 40c by February 2012 and 2.5mln at 50c by February 26 2014.

Market Cap \$13.6 mln

Year ended June 30, Values in \$000s

<b>BALANCE SHEET</b>	<b>Sep 30, 09 Proforma</b>
Current Assets	4,533
Non Current Assets..	10,028
Current Liabilities	137
Non Current Liabilities	-
Net Assets & Shareholders' Funds	14,424
Intangibles	9,946
Net Tangible Assets	4,478
Gearing (Net of Cash) %	Nil
NTA per share (cents)	4.13
Shares Issued (Millions)	108.53

<b>Cash Flows:</b>	<b>2010 3 rd Quarter</b>
Cash on hand (at open)	628
Operating Activities	(715)
Investing	(37)
Financing Activities	4121
<b>Cash on hand at Year end</b>	<b>3997</b>

**Directors:**

*Gavin Rezos, B.Juris, LLB, BA*

Executive Chairman and major shareholder. Mr Rezos was formerly CEO and a director of pSivida and is currently a director of Iluka as well as other unlisted corporates. He is a former investment banking director of HSBC Group with regional roles during his HSBC career based in London, Sydney and Dubai. He has helped to establish several companies.

*Steve Ribich B.Sc LLM*

CEO. Mr Ribich has over 10 years experience in developing new technologies that have originated from US military labs with an emphasis on materials processing utilising microwaves. Mr Ribich also has over 10 years experience in the mining and minerals exploration industry and has acted in various capacities, from exploration geologist to Managing Director, in both listed and unlisted public companies. Mr Ribich holds a Masters in International Trade and Investment Law (Deakin University). He was formerly with the US National Research Laboratories where he developed microwave technologies.

*Stefan Susta, MBA, BSc BA* Executive Director based in the US. He has spent over 10 years working with the US Department of Defence on Technology Insertion, Technology Transfer and Commercialisation. He leads Alexium's US office business operations and Department of Defence business development efforts. Mr Susta received his BSc from Virginia Tech University in Chemical Engineering and Chemistry in 1996 and an MBA from Wright State University in 2001.

*Craig Smith-Gander, BA (Military), M.Com, Non Exec Director* Mr Smith-Gander is a graduate of the Royal Military College Duntroon and served as an officer in the Australian Regular Army. He worked in the Offshore Group at Clough Engineering Group and was appointed as the Group's first Risk Manager. He has extensive investment banking and corporate finance experience and is a former director, investment banking at CIBC World Markets. He is the owner and managing director of Kwik Transport and Crane Hire Pty Ltd.

**Senior management:**

*Steve Ribich CEO*

*John Almond, BA Hons, Business Development Manager Europe*

Mr Almond has spent most of his career working in international banking in London, Switzerland, Saudi Arabia and the Middle East for several major banks principally in investment management and advisory roles. He was also a

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Principal of a Paris and New York based hedge fund group until 2002 and in his early career spent eight years in various international roles for a Fortune 500 diversified manufacturing group. Over much of his career his focus has been on identifying investment opportunities in emerging companies and new technologies.

*Dr Bob Brookins*, PH.D M.A.E. BA BS, Chief Technology Officer

Dr. Brookins has experience in organic synthesis, materials chemistry, and chem/bio decontamination. He received his PhD from the University of Florida under research advisor Dr. John R. Reynolds. Dr. Brookins' graduate work was in the synthesis and characterization of conjugated polyelectrolytes and polymers with an emphasis on developing new polymerization methods. Upon completion of his PhD, he worked at the Air Force Research Laboratory at Tyndall AFB, FL where he developed decontamination methods for chemical and biological threats, and developed novel synthetic routes for reactive and/or functional surfaces. Dr Brookins will be relocating to the new Alexium facility in Greer, South Carolina.

*Clay James*, B.Eng., Textile Line Production Engineer

Clay has over fifteen years experience in various engineering roles principally in the field of specialist films, packaging and textiles production. He has been involved in the design and build of various pilot plants in the United States, China, Australia and, South Korea as well as the maintenance, modification and refurbishment of numerous production plants in the United States. Clay will be responsible for all engineering issues at the Alexium Greer facility as well as the integration of the Alexium technology with that of its industrial customers.

*Dr Jeff Owens*, inventor of the technology will remain a technical consultant to Alexium.

**Major shareholders:**

RAB Special Situations (Master) Fund Ltd has 15.8%.

Steve Ribich, Korcula (BVI) Ltd SA has 16.9%

Piper Buchanan Ltd has 13.37%

Gavin Rezos 10.56%

(Performance shares, to vest only after Alexium achieves significant milestones, are held mainly by , Steve Ribich and Piper Buchanan with Gavin Rezos also holding performance shares)