MAGNESIUM OXIDE: A CRITICAL SUPPLEMENT



People deficient in this critical nutrient are twice as likely to die.

Magnesium is found in all the body's tissues, particularly in the bones, muscles and brain.

In fact, many bodily processes simply can't occur without it, including energy production, chemical pumps and membrane stabilization. Over 300 enzymes require the presence of magnesium ions for their catalytic action!

The list of medical conditions caused by lack of magnesium is so big that there are over 3,500 medical references on magnesium deficiency.

It is an over-the-counter mineral effective as treatment for countless diseases and disorders. And yet magnesium is also used by emergency room physicians intravenously in critical care situations in the ER for many critical care issues such as arrhythmia, constipation, seizures, heart failure, high blood pressure during pregnancy and more.

Chances are you know more than one person suffering from magnesium deficiency. A lack of magnesium in your body can lead to all these medical issues below:

Lack of MG in the body is known to cause:

- ANXIETY AND PANIC ATTACKS
- DEPRESSION
- HYPOGLYCEMIA
- LIVER DISEASE
- NERVE PROBLEMS
- RAYNAUD'S SYNDROME
- OSTEOPOROSIS
- DIABETES
- FIBROMYALGIA
- BOWEL DISEASES
- MIGRAINES
- CYSTITIS
- ASTHMA
- MUSCLE HYPEREXCITABILITY
- WEAKNESS
- LOW BLOOD LEVELS OF CALCIUM

- ANOREXIA
- APATHY
- CONFUSION
- FATIGUE
- INSOMNIA
- IRRITABILITY
- MUSCLE TWITCHING
- POOR MEMORY
- REDUCED ABILITY TO LEARN
- HEART DISEASE
- RAPID HEARTBEAT
- MUSCLE CONTRACTION
- DELIRIUM
- NUMBNESS
- HALLUCINATIONS
- TINGLING

Some estimates suggest that between 50 and 80 percent of Americans are deficient in magnesium.

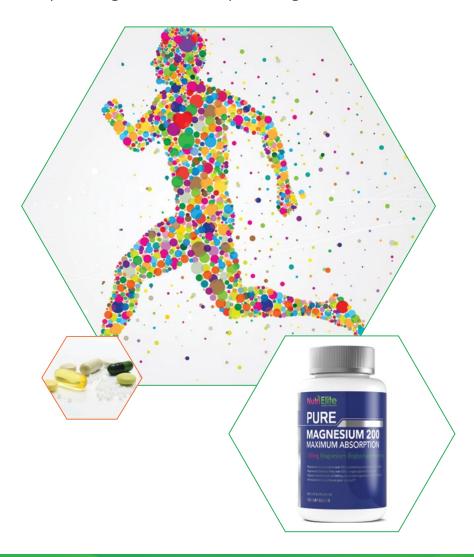
MAGNESIUM OXIDE: A CRITICAL SUPPLEMENT



What happened?

According to experts, "Magnesium is farmed out of the soil much more than calcium... A hundred years ago, we would get maybe 500 milligrams of magnesium in an ordinary diet. Now we're lucky to get 200 milligrams."

The blame goes largely to farming practices such as our use of herbicides, which act as chelators, sapping magnesium from our foods. Also, cooking and processing foods further depletes magnesium.





According to the National institutes of Health (NIH), the recommended dietary allowances (RDAs) for adult males is 400-420 mg; adult females is 310-320 mg; for pregnant females 350-360 mg daily; and for breastfeeding females, 310-320 mg.

Did you know?

Doctors recommend that you take magnesium with your calcium supplements, because magnesium helps in the absorption of calcium and offsets calcium's constipating effect. Look for magnesium citrate, chelate, or glycinate, and avoid magnesium oxide, which can be irritating to the digestive tract.

Frank Marasco, President and CEO frank@whyresources.com

MG WALLBOARD:

FIREPROOF, SMOKEPROOF, WATERPROOF, MOLD, MILDEW AND TERMITE PROOF.



Endless possibilities and benefits...

Plywood, OSB and drywall are the current standards when it comes to building construction. It's relatively cheap and easy to install. But that's just about where the benefits for drywall, plywood and OSB end. Bump your newly painted wall with a piece of furniture and you're all but guaranteed to damage it. Water damage occurs easily and in a fire... forget about it.

When it comes to magnesium wallboard, the possibilities and benefits for construction are vast. Beyond its superior durability, Mg wallboard can come in just about any shape or size, and it sticks to just about anything.

Engineered finishes, cladding, exterior sheathing, facades, flooring, laminates, panels and more.



MG WALLBOARD:

FIREPROOF, SMOKEPROOF, WATERPROOF, MOLD, MILDEW AND TERMITE PROOF.



MAGNESIUM OXIDE BOARD VS THE COMPETITION:						
ATTRIBUTES	MAGNESIUM OXIDE BOARD	GYPSUM BOARD	PLYWOOD/OSB	CEMENT BOARD		
Fire Resistant & Non- Combustible	YES	X	х	YES		
Insect Resistant	YES	X	Х	YES		
Moisture, Mold & Mildew Free	YES	X	Х	YES		
Cut/Saw – No special tools	YES	YES	YES	X		
Wallpaper over	YES	YES	x	Х		
Tile Backer	YES	X	х	YES		
Insulation Sound & Heat	YES	X	х	YES		
Environmentally 'Green' & Non-Toxic	YES	Х	Х	x		
Strong & Durable	YES	X	YES	YES		
Light Weight	YES	YES	Х	X		
Recyclable	YES	x	X	X		

MAGNESIUM CEMENT:

9,000 PSI - 45,000 PSI, LASTS 2,000 - 5,000 YEARS. ABSORBS CO2 EMISSIONS AS IT SETS.



Magnesium-based cements are among the oldest building materials in the world, and are much older than the Portland cement typically used in construction projects around the world.

Magnesium cement is incredibly durable, impervious to the weather and was used as mortar by the Romans, in the Great Wall of China, to build Stupas in India, to protect wood structures like the Forbidden City, and in 800 year old timber buildings in Europe.

What's more, magnesium cement is carbon neutral, whereas Portland cement is very carbon intensive. The rule of thumb is that for every tonne of cement you make, one tonne of CO2 is produced, making it one of the dirtiest industrial processes on the planet!

New magnesium cement technologies have the potential to completely reverse that trend. For example, a California-based company called Calera has developed a process that uses magnesium, calcium and CO2—about half a tonne of CO2 per tonne of cement produced.

MAGNESIUM CEMENT:

9,000 PSI - 45,000 PSI, LASTS 2,000 - 5,000 YEARS. ABSORBS CO2 EMISSIONS AS IT SETS.





Magnesium vs Portland Cement:

	MAGNESIUM CEMENT	PORTLAND CEMENT
Energy to produce	30% LESS	-
Permeable	YES	NO
Strength	9000 - 45,000 PSI	3,000 - 4,000 PSI
Breathability	нібн	LOW
Longevity	HIGH	MEDIUM
CO2 Emissions	Absorbs and locks in CO2 (very green)	Very carbon intensive
Variety of uses	MANY	FEW
Bonds with other compounds	High (most organic substances)	LOW (REPELS)
Heat tolerance	VERY HIGH	HIGH
Curing time	FASTER	SLOWER
Shrinkage and cracking	NONE	SOME
Repels Insects	YES	NO

Did you know:

The production of 1 tonne of magnesium cement has been shown to absorb up to 100 kg more CO2 than it emits!

Did you know:

Due to its breathability and permeability, Mg cement never rots and promotes a healthier non-toxic environment in homes and apartments.

MAGNESIUM BATTERIES: 4X CHEAPER, 12X LONGER LASTING





Currently, lithium-ion batteries are the undisputed king of the battery world, but many experts expect magnesium-ion batteries to steal that crown in the near future.

The primary issues with lithium-based batteries are price, efficiency and safety. That is to say, they're relatively expensive to make, don't store power all that well and have a tendency to explode. Magnesium, on the other hand, is far more plentiful (making it cheaper) and energy dense than lithium.

Sustainable Communities with Magnesium Batteries



BOOM!



Why do Lithium-Ion batteries explode?

To produce power, the Li-ion battery relies on three main components: the positively charged cathode, which is made of metal oxide, the negatively charged anode, which is made of graphite, and the liquid electrolyte—a solvent containing lithium salts—that enables the electric charge to flow between the two poles.

Lithium-ion batteries explode because a manufacturing defect and/or the heat produced during charging causes degradation of the thin wafer separating the anode and the cathode.

When the separator is breached, it causes a short circuit, which can lead to fire or even an explosion!

Magnesium-ion batteries would use a solid electrolyte, hence, no short circuit and explosions.

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MAGNESIUM BATTERIES: 4X CHEAPER, 12X LONGER LASTING

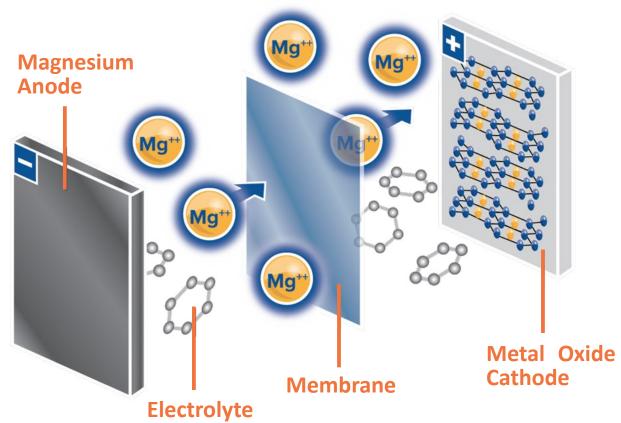


What sets a Mg-ion battery apart from its Li-ion counterpart is that the electrolyte is solid, not liquid like we find in batteries nowadays. This means that the batteries will be far safer because they will not catch fire like Li-ion batteries are known to.

More upsides...

Another upside of the Mg-ion battery is that its capacity would be double that of a Liion battery. For the rest of us, that means smaller, longer lasting electronic devices and electric cars that travel farther on a charge and are safer to drive.





MAGNESIUM METAL INGOTS: THE FUTURE HAS ARRIVED



Magnesium ingots are the lightest and strongest based on weight to density ratio. They are 75% lighter than steel, 60% lighter than titanium and 33% lighter than aluminium, all of which results in lower CO2 emissions in all uses.





The largest market for magnesium metal is aluminum alloying and die casting, comprising two thirds of magnesium metal use. Primary industry is automotive.

The forecast is for growth, especially in automotive...





According to GM, there is a 7 percent improvement in fuel economy for every 330 pounds reduction in a vehicle's weight. That is why manufacturers have a mandate to make cars lighter and more fuel efficient.

Growth Expectations vary Depending on Source. Projection is for huge growth.

Potential Mg Growth Scenario 1:

Used on cars since 1920, the average light vehicle has about 10 pounds* of magnesium in its composition and that number is poised to triple by 2025, according to a forecast by Ducker Worldwide, a Troy, Mich., consulting and research firm.

The Math:

88.5 MM* vehicles per year globally X 10 lbs X factor of three (Ducker forecast for growth)

2025 AUTOMOTIVE Mg DEMAND: 2.66 billion lbs

DIE CASTINGS ALUMINIUM ALLOYS TITANIUM REFINING ALUMINIUM REFINING OTHER

Potential Mg Growth Scenario 2:

A report from the United States Automotive Materials Partnership (a collaboration between car makers GM, Ford, and Chrysler) estimates that by 2020, 250 pounds of magnesium will replace 500 pounds of steel and 90 pounds of magnesium will replace 130 pounds of aluminum per vehicle, resulting in an overall 15% weight reduction.

The Math:

88.5 MM* vehicles per year globally X 340 lbs per vehicle. POSSIBLE 2020 AUTOMOTIVE Mg DEMAND: 30 billion lbs

* Source: U.S. Automotive Materials Partnership



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MAGNESIUM METAL INGOTS: THE FUTURE HAS ARRIVED



Aircraft, Defence, Consumer Goods

All this lower weight and durability means that magnesium is ideal for the technological age.

No surprise then that more and more electronics manufacturers are using new lightweight magnesium alloys for their products. For example, did you know that Samsung has actually patented a new alloy called Metal 12, named so because Mg happens to be the 12th element in the periodic table?

Magnesium alloys could save one airline more than \$200 million!

Finding a safe compromise between low weight and high strength is critical when creating an aircraft.

Surprisingly, even the weight of the seats on an aircraft can make a huge difference in operating costs. One research scientist used 3D printing technology and magnesium metal to design a new aircraft seat, with eye popping results.

At just 766 grams, each individual seat frame is 54% lighter than the conventional aluminum seats in use today. So if an aircraft maker were to replace all 615 seats on its A380 jets with the new seat frames and did it across a fleet of 100 planes, about how much could be saved? The research suggests it would add up to a whopping \$206,648,920 based on 2015 jet fuel costs. The fuel reduction also equates to a reduction of 126,000 tons of CO2 emissions over the same period. That's the equivalent of removing 80,000 cars from the road for a year.

	A321 - 236 SEATS	A380 - 615 SEATS
Weight Savings	214KG	557KG
Annual Fuel Savings Per Aircraft	9.6 TONNES	63 TONNES
Annual Carbon Emission Reduction Per Aircraft	28.9 TONNES	190.1 TONNES
Annual Fleet Savings (assuming fleet of 100 aircraft)	\$1,569,365	\$10,332,446
Lifetime Fleet Savings (100 aircraft over 20 years)	\$31,387,300	\$206,648,920
Fleet Lifetime Reduction in Carbon (100 aircraft over 20 years)	57,800 TONNES / 12,298 CARS	125,000 TONNES/80,894 CARS

Other facts to remember:

- Magnesium is a Strategic Metal for Aerospace and Defense
- Lightweight properties of magnesium improve performance of aircraft, vehicles, armor and military equipment.
- Magnesium metal in power tools and sporting goods such as bicycle frames, ski bindings and tennis rackets is also on the rise.
- Magnesium is used as an alloy to increase tensile strength both in aluminium wrought and cast alloys.
- Pure magnesium is also added when producing pre-alloys for the treatment of nodular cast iron.

MAGNESIUM METAL INGOTS: THE FUTURE HAS ARRIVED



The Magnesium Advantage

- Magnesium is the lightest of all structural materials, is the 8th most abundant element on earth and is 100% recyclable.
- Mg metal has the best strength-to-weight ratio of any commonly used structural metal.
- Excellent dimensional stability as well as high impact and dent resistance.
- Exceptional dampening capacity and low inertia making it ideally suited for parts that undergo frequent and sudden changes in motion direction.
- The newer high purity alloys can deliver better corrosion resistance than carbon, steel and some aluminum alloys.
- Thin-walled die casting means structures can be made as one piece rather than assembled from several components. This simplifies design, lowers assembly costs, improves reliability, minimizes tooling costs and reduces joints, fasteners and welds.
- Consistent and predictable shrink rates mean minimal distortion or casting stress.
- Low heat content means less energy is required to reach casting temperatures and castings cool quicker so cycle times are faster.
- Lower temperatures and low affinity for iron reduce the effects of thermal fatigue and erosion on dies so they last longer.

Magnesium vs. Plastic

Upon superficial examination, plastic can appear quite appealing, primarily because of the reduction in weight and the initial cost comparison. Upon closer inspection, however, those advantages quickly evaporate. Compared to die cast magnesium parts, plastic parts are often subject to dimensional stability issues, surface deterioration, fit issues due to temperature changes and a lack of rigidity. Die cast magnesium parts typically outperform plastics by delivering:

- Stronger and greater wear resistance than plastic.
- Superior stiffness as plastic often requires significant reinforcing.
- Greater impact resistance and energy absorbing capacity.
- Superior thin-walled near net shape casting of larger parts.
- Higher temperature applications.





MAGNESIUM METAL INGOTS: THE FUTURE HAS ARRIVED



Magnesium vs. Aluminum

Imagine a car made entirely of die cast aluminum parts. Now imagine that exact same car made from die cast magnesium parts. The magnesium car would be 1/3 lighter in weight than its aluminum cousin. The magnesium die cast parts outperform aluminum ones in so many ways. The advantages include:

- 33% lighter than aluminum.
- Similar or greater mechanical properties.
- Lower working temperatures extend die life and reduce energy consumption during production.
- Machining is faster and easier and machining tools last significantly longer.
- Superior thin-walled near net shape casting of larger, more complex parts so there are fewer components and less assembly required.
- Greater general corrosion resistance.



As standards for greater fuel economy tighten and automobile designs become more complex, steel simply can't deliver on higher performance expectations. Lightweight magnesium requires far less energy during the entire die cast production process and designs can be far more elaborate without sacrificing strength. Tolerances are tighter and the fit and finish in the final product is vastly superior. The advantages magnesium offers over steel include:

- 75% lighter than steel.
- Complicated thin-walled near net shape casting that would be impossible to achieve using steel.
- Consolidation of individual components into a single die cast magnesium part, which improves rigidity while reducing welding costs and assembly time associated with steel.
- Tooling costs are significantly reduced due to consolidation of multiple parts into a single part.
- Lower working temperature reduces energy consumption during production and extends die life.
- Superior dimensional stability and repeatability.



MAGNESIUM NITRATE FERTILIZER: THE CHLOROPHYLL ATOM



All plants, animals and humans require magnesium for life!

Just ne

Just as humans and animals often need magnesium supplements to stay healthy, plants need magnesium supplements in the form of magnesium nitrate.



In fact, without magnesium, plants couldn't be green. That's because Mg is the central atom in every chlorophyll molecule, and is essential for photosynthesis and the formation of carbohydrates. Without magnesium, chlorophyll cannot capture the solar energy needed for photosynthesis.

Magnesium is also involved in enzymatic reactions and assists in generation of energy. Deficiency of Mg retards plant development, resulting in decreased yields and poor quality plants.

Mg nitrate fertilizer replenishes nutrients in dead soil and puts the depleted Mg back into the soil.



Magnesium is needed to give leaves their green colour, so when there's a deficiency, yellow breaks through between the veins and around the leaf edges instead. Color loss reflects the shortage of chlorophyll in the plant.

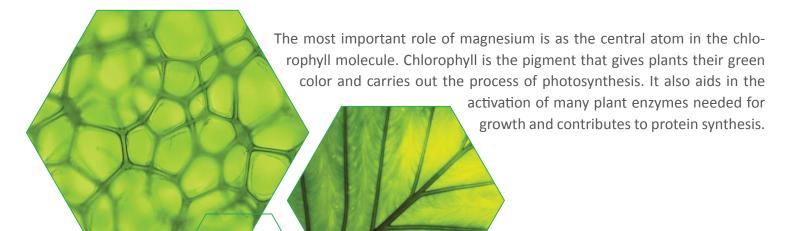
Technically, magnesium is a metallic chemical element. But as useful as it is in manufacturing and construction, it is also a macronutrient that is critical for plant life. Magnesium is one of the thirteen mineral nutrients that come from soil that can be absorbed through the plant's roots.

Once inside the plant's roots, stem and leaves, magnesium is involved in several different processes. Many enzymes in plant cells require magnesium in order to perform properly.

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MAGNESIUM NITRATE FERTILIZER: THE CHLOROPHYLL ATOM





How is magnesium used in fertilizer?

Conditions such as low soil pH, low temperatures, dry soil conditions and high levels of competing elements, such as potassium and calcium, reduce the availability of magnesium. Under such conditions, magnesium deficiency is more likely, making an application of magnesium fertilizer necessary.

Magnesium nitrate is a hydrated form of nitro-magnetite, a naturally-occurring mineral. Because it is water-soluble and supplies magnesium and nitrogen in a form easily accessible to plants, magnesium nitrate is also commonly employed as a fertilizer applied through irrigation.



ARE YOU TAKING THE RIGHT MAGNESIUM SUPPLEMENTS?



Bioavailability: How well is a substance absorbed and utilized by the body







Magnesium Oxide

- inexpensive Common & form of magnesium
- Strong laxative effect



Magnesium Sulfate

- a.k.a Epsom Salts
- Also provides sulfer, which helps soothe tired muscles



Magnesium Orotate

Heart health support



Magnesium Citrate

- **Budget-friendly option**
- be supplemented with capsules / tablets, ionic liquid, or drink mix



Magnesium Glycinate

Optimum bioavailability



- Can be supplemented with pills/ capsules or liquid
- Also available as magnesium oil, which nourishes and soothes skin



Magnesium Lysinate

May support gastric health



Magnesium Taurate

Promotes calmness and heart health



Magnesium Aspartate

Promotes cellular energy

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MAGNESIUM CHLORIDE:

KEEPING OUR ROADS SAFE AND FREE OF ICE AND DUST





Magnesium chloride is most commonly used for dust control and road stabilization. It attracts moisture from the air and resists evaporation. As such, it binds to fine dust particles to keep gravel roads stabilized, to slow the loss of aggregate, and to reduce the need for costly regrading.

Offered in 33% liquid form, this environmentally preferred compound is used in sensitive watershed and wetland areas and in places where workers prefer the therapeutic effects of this natural compound.

Perhaps more importantly, for farmers and people with respiratory issues, magnesium chloride keeps the dust on gravel roads down, which is safer for human and crop health.

MgCl2 for Ice

The second-most common use of magnesium chloride is ice control.

Prior to departments of transportation using "Mag Chloride" on hazardous winter roads, deaths during cold northern winters were a more frequent occurrence than they are today.

On icy roads, magnesium chloride is more effective than calcium chloride, especially in colder weather.

Magnesium chloride is typically considered to be safer for use around plants and concrete surfaces than other products, as it poses fewer threats to the environment and corrosive qualities.

In addition to this, the ice melter is very effective and fast acting. MgCl2 is a hygroscopic de-icer, meaning that it is able to absorb moisture and form into a brine very quickly, instigating the ice melting process.

It's also less expensive and more plentiful, making it the obvious choice for road safety.

In short, Mag Chloride saves lives, costs less and is more available!







Did you know?

80% of all roads are gravel. This, combined with passing cars and trucks, leads to dusty conditions in communities near these roads. Fugitive dust can cause health problems in the young, elderly and people with respiratory conditions.

This dust can also lead to clogged pores in plants and cause stunted crop growth. By applying magnesium chloride solution to gravel roads, particles in the air are minimized, leading to healthier plants and humans.



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MAGNESIUM SILICATES CONVERTING CO2 TO USEFUL GREEN PRODUCTS



THE POWER OF MG

Magnesium is an incredibly important element. In fact, with end uses ranging from healthcare and cosmetics to construction and batteries, few other raw materials play a more crucial role in our lives. Add in EV and the future looks bright for Magnesium.

It turns out that Magnesium also holds a key to reducing greenhouse gas emissions. And now West High Yield is partnering with the scientist who has advanced the technology more than any other in the past decade.

HOW MINERAL CO2 SEQUESTRATION WORKS

In its gaseous state, carbon dioxide is a harmful greenhouse gas. Now scientists have found a way to economically convert CO2 with Magnesium Silicate* into useful products in any number of industries such as agriculture, construction, defence, cosmetics, pyrotechnics and more.

(*West High Yield has more than 40 million tonnes of Magnesium Silicate rock on its Record Ridge project in British Columbia.)

This Magnesium CO2 sequestration technology would use a specially prepared magnesium solution to capture CO2 directly from the source (i.e. flue gas) and convert it to environmentally friendly and valuable magnesium carbonate.

In order to supply the required magnesium rock, West High

Yield is developing a large, low cost, high-grade magnesium resource in Western Canada, the Record Ridge Magnesium Project.





Did you know?

The United States alone contributes more than 5 billion tonnes of CO2 to the atmosphere every year... and growing. CO2 overload in our atmosphere is the primary driver of global warming today. There are other greenhouse gases, but for over 250 years no other source has contributed more to global warming than CO2.

This carbon overload is caused mainly when we burn fossil fuels like coal, oil and gas or cut down and burn forests.

Imagine a technology that could drastically reduce CO2 emissions while simultaneously creating valuable commodities from those same emissions?

This technology has arrived.

MAGNESIUM SILICATES CONVERTING CO2 TO USEFUL GREEN PRODUCTS



HOW CAN THIS NEW MINERAL CARBON DIOXIDE SEQUESTRATION TECHNOLOGY MAKE A DIFFERENCE?



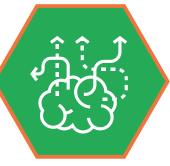
It mimics natural weathering processes in which magnesium in rocks reacts with CO2 from the atmosphere to form solid carbonates.



This process is usually very slow and happens over several years.
However, this technology vastly speeds up the process.



It is an economically competitive technology.



The resulting Mg carbonates have many potential applications in agriculture, construction, defence, cosmetics, pyrotechnics and more.

WEST HIGH YIELD

Helping to develop greener materials and technologies for a better future.

Record Ridge Measured and Indicated Mineral Resources of approximately 43 MT @ 24.6% Mg, using a 21.9% cut-off. Approximately 10.6 MT contained Mg.

Potential end uses of the Magnesium from the Record Ridge Deposit are many:

AEROSPACE, AGRICULTURE, AUTOMOTIVE, CONSTRUCTION, CONSUMER GOODS, COSMETICS, DEFENCE, ENERGY STORAGE & BATTERIES, ENVIRONMENTAL, HEALTH CARE, PYROTECHNICS, TECHNOLOGY, AND MORE

Find out more at whyresources.com TSX-V: WHY