

Industrial Minerals review 2022

by Mike O'Driscoll*

Learning to be greener and smarter

Last year's introduction to the Industrial Minerals Annual Review concluded with a pointer to the challenges facing the sector in developing and employing carbon emissions reduction, energy conservation and recycling practices for a sustainable future. Throw in further critical raw material (CRM) developments, the energy transition and continuing geopolitical hotspots, and we have the chief factors that started to shape the industry in 2022 and its near- to medium-term future.

Critical raw materials up front and center

There has already been much reported on specific CRM developments, including a recent update on U.S. CRMs by Steven Fortier et al. of the U.S. Geological Survey (USGS), published in *Mining Engineering* in May 2023.

Perhaps most significant from a big-picture standpoint is the accelerating activity from government and state organizations across the world, as well as the mainstream media, as they seek to understand and compile data on their respective CRM resources and supply-chain risks.

Indeed, even the recent G7 Hiroshima Communique included reference to a "Five-Point Plan for Critical Mineral Security." Ahead of the pack here is the European Commission (EC) (representing 27 countries) and the United States, although others, notably Canada, Australia, Brazil and India are also getting their acts together, with the likes of the United Kingdom and France as latecomers to the party.

The EC had a very busy 2022 launching a revised CRM list, notably adding feldspar and manganese, and in March 2023, an ambitious Critical Raw Materials Act. The latter introduced a new category of "strategic raw materials" (SRMs), important for technologies that support the twin green and digital transitions, and defense and aerospace objectives (this includes rare earth elements and battery-grade lithium, manganese and natural graphite).

"We are experiencing a global race for the supply and recycling of critical raw materials," noted Thierry Breton, commissioner for the Internal Market, EC.

The EC's CRM Act aims to provide the European Union (EU) with tools to ensure access to a secure and sustainable supply of CRMs, stating that not more than 65 percent of the EU's annual consumption of "each SRM at any relevant stage of processing" is sourced from a single third country. Moreover, benchmarks are set for EU annual SRM consumption to be met by at least 10 percent extracted in the EU, at

least 40 percent processed in the EU and at least 15 percent from EU recycling.

Most welcome to EU mineral developers will be the act's promise to reduce administrative burden, simplify permitting procedures for EU CRM projects and support access to finance. Too good to be true?... Let's see. Certainly, EC President Ursula von der Leyen laid it on the line at the World Economic Forum in Davos, Switzerland in January 2023, as she unveiled the CRM Act: "The next decades will see the greatest industrial transformation of our times — maybe of any times."

The U.S. Inflation Reduction Act (IRA), signed into law on Aug. 16, 2022, has also been instrumental in focusing minds on CRM supply, although how much it will influence upstream U.S. CRM development remains to be seen.

Certainly, downstream activity is already emerging, with the likes of Ford Motor Co. recently signing several lithium supply agreements with a focus on material that will be eligible under the IRA, securing supply from SQM and Albemarle (both in Chile) as well as three North American projects in development.

The flip side to all this is that certain CRM-rich countries may take steps to reinforce control over their supply, such as Chile in its April 2023 announcement of plans to nationalize its lithium industry.

Energy and environment top priority

The greatest impact on the future of the industrial minerals industry will be climate change and the steps taken by industry and consumers alike to mitigate against this.

There are several strands to this that certain companies in the sector have already started to address in recent years, and it would be fair to say that the pandemic lockdown periods of 2021-2022 have helped companies reassess and re-strategize their "green" priorities.

"Energy transition" is the big buzz word, and it is top of the agenda for mineral companies as they strive to switch to alternative energy sources to reduce their carbon dioxide (CO₂) footprints, such as by using electrical mining equipment or considering other fuels for processing operations.

Mining and processing is an energy-intensive industry, so it will take time to develop an optimum solution. With rising petcoke costs, mineral plants using kilns for drying and in particular for widespread calcination operations, such as in bauxite, magnesia, dolomite and lime production, will, or should, be evaluating alternatives to fossil fuels.

For example, in 2022 Grecian Magnesite

started using a new biomass-fed burner system, accounting for 10 percent (by energy basis) for its thermal power demand; this is set to increase to 20 percent in 2023 and 40 percent by 2024. This was part of its participation in BAMBOO, an EU-funded project developing new technologies for energy and resource efficiency.

The company is also looking to switch from using fossil fuels to liquefied natural gas (LNG), which would not only result in reducing CO₂ emissions by at least 40 percent and improving energy efficiency by at least 8 percent, but also render flue-gas desulfurization (FGD) unnecessary (posing questions on the future of FGD scrubber minerals?).

The other main energy strand in decarbonization is in carbon capture and utilization (CCU). While research on CCU has been around for some years, it is only recently that serious projects are getting off the ground and industrial mineral companies are starting to employ such technology. The added benefit, and potential market opportunity, is that certain CCU projects result in production of some very useful synthetic mineral products.

Leading Australian decarbonization technology company Calix has already been active in supplying and developing its alternative flash calciner technology to the European cement, lime, magnesite and refractory industries. Earlier this year, leading global magnesia and refractories producer RHI Magnesita signed a long-term strategic cooperation agreement with another “cleantech” Australian company, MCI Carbon, “... to achieve its goal of becoming a CO₂-neutral business.”

MCI Carbon has developed a mineral carbonation process that captures and converts industrial CO₂ emissions into solid bulk materials, including calcium and magnesium carbonate, which can be used in new low-carbon products for the construction, manufacturing and consumer markets. Other companies, such as Paebbl in the Netherlands, are evaluating proprietary mineral carbonation processes that essentially accelerate and scale a natural process using heat and pressure to form synthetic mineral products. Paebbl uses CO₂ emissions and ground olivine to produce mineral filler products. Another project using olivine is being

developed by Holcim and Eni, with Eni storing its CO₂ in olivine and Holcim using the carbonated olivine as a new low-emission raw material for its new “green cement” production.

Thus, we are seeing the generation of a new market outlet for olivine (and other magnesium silicate materials), and producing new mineral products and capturing CO₂ at the same time.

An EU Horizon Europe research project called Carbon4Minerals is devoted to developing innovative technologies for CO₂ capture for use in carbon-negative construction products.

We will see more such initiatives being rolled out in the near future.

Geopolitical impact on supply chains

And finally, just a reminder that unfortunately, geopolitics is never far away from negatively impacting mineral supply chains. Lessons have to be learned from the COVID-19 pandemic and the Russia-Ukraine War.

While the Russia-Ukraine War continues with seemingly no end in sight and its impact on logistics persists, in the Eastern Hemisphere there are warnings of a potentially more catastrophic impact on global shipping logistics with the simmering China-Taiwan standoff.

A “Zero China” policy regarding mineral supply by most traders and consumers, while tempting, is unlikely and economically ill-advised owing to the country’s industrial mineral wealth for export markets at relatively lower prices (though often cyclical), despite ongoing supply challenges.

But a “Cold Peace” in the region endures, so companies must now surely build supply-chain resilience and reduce excessive dependency on mineral supply from China (or indeed elsewhere in East Asia): that is, they are well advised to derisk and diversify their mineral supply chains. Certainly, this is a case of hoping for the best but planning for the worst. Mineral supply is not all about “just in time” — it now needs to be about “just in case.” ■

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Editor’s note: The articles provided by the U.S. Geological Survey (USGS) in this section are based on data included in the USGS Mineral Commodity Summaries 2022 (<https://www.usgs.gov/centers/national-minerals-information-center/mineral-commodity-summaries>). The USGS Mineral Commodity Summaries are published on an annual basis; this report is the earliest government publication to furnish estimates covering nonfuel mineral industry data. Data sheets contain information on the domestic industry structure, government programs, tariffs and five-year salient statistics for more than 90 individual minerals and materials.

Throughout this review, measurements are expressed as metric units unless the author provided conversions.