WORKERS' FORUM
ONLINE SUPPLEMENT OF THE MARXIST-LENINIST

March 22, 2021 - No. 20

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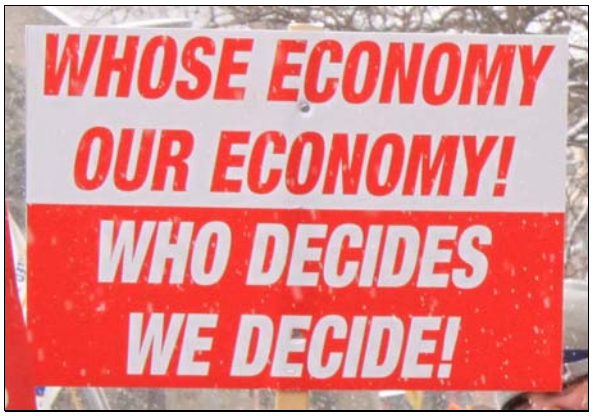
Rio Tinto has announced that it "will become the first producer of high-quality scandium oxide in North America" with a new commercial-scale pilot plant to be built in Sorel-Tracy, Quebec.

On one of Rio Tinto's websites dedicated entirely to scandium, we learn that the company has "developed a new process to extract high purity scandium oxide from the ilmenite ore at our metallurgical installation in Quebec, Canada."[1] The mining and metallurgical company has developed a new process to extract scandium oxide, classified as a critical mineral, from by-products generated during the production of titanium dioxide at the Rio Tinto Fer et Titane

(RTFT) metallurgical complex in Sorel-Tracy, Quebec.



Scandium is used to produce high performance aluminum alloys. It is a silvery white metallic element that falls into the rare earth category which, when used in small quantities, has drastic effects on properties of matter. Addition of only 0.1 to 0.2 per cent of scandium in aluminum alloys substantially increases mechanical strength, heat and corrosion resistance, as well as improves welding properties.

In the late 1950s, the Soviet Union had developed scandium-aluminum alloys which were used in the construction of military aircraft, advantageous for fighter jets such as the Mig-21 and Mig-29, as well as for missiles, in terms of weight, maneuverability and range.[2]

In recent years, the U.S., Canada, Australia and the European Union have all classified scandium as a critical mineral. In January 2020, Canada and the U.S. finalized a Canada-U.S. action plan on critical minerals collaboration to secure supply chains for critical minerals -- such as scandium -- which are "needed for important manufacturing sectors, including communication technology, aerospace and defence, and clean technology."[3]

In February 2020, *TML Weekly* published an article entitled "Canada-U.S. Joint Action Plan on Critical Minerals Collaboration -- No to Canada's Integration into the U.S. Imperialist War Economy!" The article explains how the federal and Quebec governments had been working hand in hand since 2019 with the U.S. Trump administration to ensure the supply chain of 35 strategic and critical minerals for the U.S. war economy.[4]

Now further developments will take place with regard to strategic minerals, as revealed in the Joint Statement issued following the bilateral virtual meeting held between Prime Minister Justin Trudeau and U.S. President Joe Biden on February 23, in which "[t]he leaders agreed to strengthen the Canada-U.S. Critical Minerals Action Plan to target a net-zero industrial transformation, batteries for zero-emissions vehicles, and renewable energy storage."[5]

Currently, global demand is estimated at between 12 and 15 metric tonnes per year, mainly supplied by China and Russia. With the new applications that are being developed, this demand is set to grow. Some analysts are predicting that by 2028, the demand could be as much as 300 metric tonnes per year. Rio Tinto's first module pilot plant expected to begin production by the end of June 2021, will have a capacity for three metric tonnes per year of scandium oxide. A Rio Tinto spokesperson noted that the plant can be scaled up by adding more modules to meet demand. Production could be increased to reach over 12 metric tonnes annually according to estimates provided.

Rio Tinto's scandium website mentions that the company's operations in Quebec are "a new

innovative, reliable and accessible alternative to existing and limited sources of scandium in the market. [The] advantageous geographic location in northern Quebec, Canada, is ideal for efficiently supplying the North American market."[6]

Notes

1. Element North 21, Rio Tinto

2. Project Scandium Aluminium Europe (SCALE) supported by the European Commission.

3. "Canada and U.S. Finalize Joint Action Plan on Critical Minerals Collaboration," News Release, Natural Resources Canada, January 9, 2020

4. "Canada-U.S. Joint Action Plan on Critical Minerals Collaboration - No to Canada's Integration into the U.S. Imperialist War Economy! - Fernand Deschamps", *TMLWeekly* #2, February 1, 2020

5. "Summit Between Canadian Prime Minister and U.S. President -Joint Statement of President Biden and Prime Minister Trudeau at the Conclusion of Their Meeting, *TML Monthly*, March 7, 2021.

6. Element North 21, Rio Tinto.

Rio Tinto's Role in the Scandium and Aluminum Alloy Market

Scandium is a rare earth element. It is used in the manufacturing of military and civilian aircraft, lasers and fuel cells. Scandium oxide comes in the form of a white powder, the price of which varies according to purity and supply and demand. There is no organized global market for scandium at this time. According to the *U.S. Geological Survey*, in 2019 high purity scandium oxide sold for around $3,900 U.S. per kilogram.

Scandium oxide is also used to produce high performance aluminum-scandium master alloys for the aerospace and military industries, and for 3D printing. Its advantage is to produce alloys which make it possible to carry out highly efficient welds, that would reduce the weight of aircraft by 10 to 15 per cent and reduce the time required for their assembly.

The most important application of these alloys remains in the production of combat aircraft as evidenced by the title of a promotional item recently published on the Rio Tinto website entitled "Mineral Waste to Fighter Jets -- Pioneering a new source of a critical mineral." In that article Rio Tinto touts the fact that scandium is a by-product of tailings recycling once the ilmenite ore concentrate is processed to recover titanium oxide. According to the reasoning promoted by various levels of government, the recovery of scandium to make alloys with aluminum fits nicely into the "sustainable development" projects of a "green economy," as promoted by the federal and Quebec governments, all this to divert from the fact that "scandium can be used in industries like aerospace and defence."[1]

A Rio Tinto January 14 press release also states that scandium oxide is used to improve the performance of solid oxide fuel cells, which are used as a power source for data centres and hospitals, as well as in niche products such as lasers for military purposes, the lighting of stadiums or television studios.

Other future applications are computer and television screens, more conductive high voltage transmission cables and in the automotive industry where aluminium-scandium alloys 40 to 60 per cent lighter and with a higher hardness coefficient are expected to increasingly replace steel, titanium and other composite materials used in hybrid and electric vehicles.[2]

Today, for example, aluminum-scandium-magnesium alloy powder is used for additive manufacturing (3D printing of metals by laser fusion) to create components used in aircraft construction. This enables the creation of high strength components for the aerospace industry which include exceptional high fatigue resistance properties with a high strength coefficient close to that of titanium alloys but less dense. Scandium is also found in electronic ceramics and glass compositions. Some of the ceramics created with scandium have a very high hardness that approaches that of diamonds.

Notes

1. "Mineral Waste to Fighter Jets -Pioneering a new source of a critical mineral," Rio Tinto website.

2. "Are Aluminium-Scandium Alloys the Future?," Aluminium Insider, July 28, 2017

Pay-the-Rich Scheme: Part of the "Green Economy"

In its January 14 press release, Rio Tinto announced that it "is investing U.S.$6 million for the construction of a first module in the plant, with an initial capacity to produce three tonnes of scandium oxide per year, or approximately 20 per cent of the current global market." The government of Quebec will contribute to the project to the tune of approximately $850,000 within the framework of the $68-million pay-the-rich scheme announced last October by the Legault government as the "Québec Plan for the Development of Critical and Strategic Minerals 2020-2025 for a greener Quebec."[1]

In its October 24, 2020 issue, *The Marxist-Leninist Weekly* had already highlighted how the federal and Quebec governments responded to the Trump administration's call to secure a supply chain for minerals critical to the U.S. war economy.[2] By integrating, among other things, the Canadian rail network with the North American rail network, the economies of Canada and Quebec are being prepared to participate in the increasingly fierce inter-monopoly and inter-imperialist rivalry for the control of sources of raw material, commodities, markets and spheres of interest.

This is how Quebec's Minister of Energy and Natural Resources, Jonatan Julien, qualified the Rio Tinto announcement: "RTFT's scandium oxide valorization project is a concrete example of how we can extract value from our mining wastes. It demonstrates our ability to innovate and seize business opportunities in a growing market as we strive to ensure secure supplies of critical minerals. This business has the potential to become a major scandium supplier outside China."[3]

Rio Tinto Fer et Titane (RTFT) already operates an open-pit ilmenite mine in Quebec at Lac Tio, near Havre-Saint-Pierre, on the North Shore, which is the largest ilmenite deposit in the world (see location "A" on the Quebec map). The ore is then sent by ship to its metallurgical complex in Sorel-Tracy, where titanium dioxide, pig iron, steel and world-class metal powders are extracted (see location "B" on the Quebec map). In total, nearly 1,650 workers are employed at these two

Quebec sites.

Rio Tinto is currently testing the production of small quantities of a high-performance aluminum-scandium master alloy using scandium oxide produced by RTFT, with the support of its aluminum sector based in the Saguenay-Lac-St-Jean region in Quebec (see location "C" on the Quebec map).

Map showing the three major Rio Tinto sites for mining (A) and refining (B) titanium and refining aluminium (C) in Quebec *(click to enlarge)*

Quebec's Saguenay-Lac-Saint-Jean region is also an important hub for the aluminum sector, which for Rio Tinto represents almost half of its global production of this metal. Rio Tinto's activities in the region include an alumina refinery, four wholly owned aluminum smelters, six hydroelectric plants, the Arvida Research and Development Centre (CRDA), the Aluminium Operational Centre, a rail network and a port.

All these infrastructure projects related to minerals critical to the U.S. imperialist war economy are considered part of a "sustainable greener economy." Their aim, however, is not a sustainable natural environment but to serve the U.S. war economy and its striving for world hegemony over China and Russia. War production is the greatest cause worldwide of collective insecurity as well as pollution. So long as the aim is to make the rich richer, extracting scandium from by-products generated during the production of titanium dioxide will not be used to serve the people. Canada's highly qualified work force and its resources are its greatest assets which must be brought under the people's direction and control.

Notes

1. "The Gouvernement du Québec launches the Québec Plan for the Development of Critical and Strategic Minerals: future resources for a greener Québec," Quebec Government Press release, October 29, 2020

2. "Canada's Strategic Critical Minerals:Who Decides? -- Integration of Quebec's Northern Regions into U.S. War Economy - Fernand Deschamps," *TMLWeekly* #40, October 24, 2020

3. "Rio Tinto enters scandium market with construction of new plant in Canada," Rio Tinto January 14, 2021 press release.

(With files from: Aluminum Insider, Canadian Mining Journal, Government of Canada, Government of Quebec, Rio Tinto, SCALE, TML Weekly, TML Monthly. Photos: Service de cartographie du gouvernement du Québec)