Hard rock project is music to industry's ears

Eighty per cent of tungsten production is currently from China. A feasibility level project in New Brunswick, which will benefit the aerospace, defense, and manufacturing industries, has the potential to be a major Canadian-sourced critical minerals supplier.

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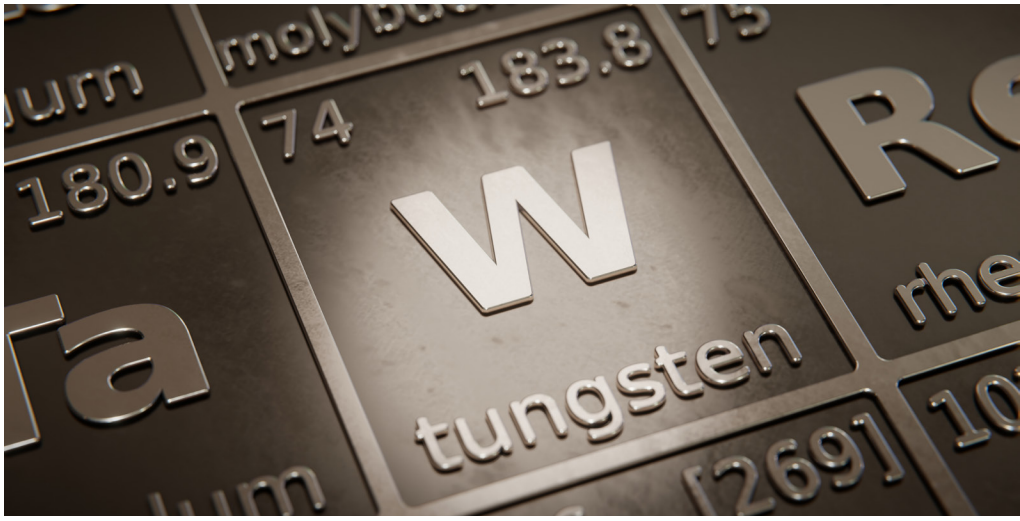

Tungsten (or Wolfram) is a metal that is helping drive global innovation, modernization, and transformation. It may come as a surprise to you, but beyond its placement as Element 74 on the Periodic Table, this naturally occurring grayish-silver metal is a key ingredient in manufacturing in the aerospace, defense, heavy manufacturing, technology, and resource industries. Its unique chemical structure makes tungsten a highly sought ingredient for innovation technologies across these industries.

Tungsten has the highest melting point of all metals (3,422˚C (+/-15˚C)) and a boiling point of 5,700˚C (which is similar to the temperature at the surface of the sun). Tungsten also has the highest tensile strength of any pure metal and, with a density of 19.25 g/cm^3, it plays beside Iron Maiden as one of the Earth's heaviest metals [bands]. Tungsten is extremely hard, has the lowest vapour pressure of all metals, and has high thermal and chemical stability. Notwithstanding other attributes, tungsten is truly a unique metal that has pervasive uses entrenching its importance in global industrial development.

Many of tungsten's sound bites in the metals arena come from its traditional uses in cemented carbides (cutting tools that are resistant to abrasion and impact), steel (alloys), electrical (e.g. filaments in lamps, etc.), the electronics industry (electron emitting devices such as smartphones and microwaves), and chemical applications (catalysts and reagents).[1] Tungsten is seemingly everywhere yet highly understated in its importance and presence when compared to higher profile base and precious metals. In some places, tungsten is an integral, and largely irreplaceable ingredient for fabrication or manufacturing in:

- **Aerospace:** Counterweights for satellite, helicopter rotor blades, and aerospace gyro control.
- **Defense:** Ammunition, warheads, equipment, missiles, and fighter jets.
- **Heavy industries:** Cutting tools and super alloys.
- **Manufacturing:** Cutting tools, super alloys, and light bulb filaments.
- **Technology:** Battery anodes, radiation shielding, and x-ray tubes.
- **Resource industries:** Drilling tools.

Beyond its traditional uses, tungsten also plays a critical role in building sustainability into global innovation, modernization, and transformation. Because of its high electrical conductivity and resistance to corrosion, tungsten has been identified as a potential ingredient in electric vehicle (EV) batteries. These batteries would be faster charging,[2] degrade more slowly[3], and would lower the risk of fire, translating to an eco-friendlier electrification of the automotive industry. Once again, it is tungsten's unique chemical structure that researchers have identified as a critical ingredient in the global EV battery revolution.

Tungsten also plays a part in the global development of renewable energy space, for example, wind energy. Growth in wind power helps to diversify the energy mix and reduce our reliance on fossil fuels. As mentioned earlier, tungsten is hard – tungsten carbide is second to only diamonds on the Mohs Hardness Scale, and therefore it is durable. This and other properties make it an important component of alloys used in wind power technology.[4] This harnessed wind energy could then be stored in lithium-tungsten oxide batteries, which have potential

for higher energy storage capacity and enhanced stability. To take this one step further, because of its high thermal / electrical conductivity and melting point, tungsten is the ideal ingredient for numerous electrical applications, including enhancements of electrical grid infrastructure to support the efficient delivery of wind generated electricity.

Ws2 Mos2 nano sulfide powder lubricant, which is high purity tungsten molybdenum.

Impressive potential for Canadian tungsten project

Northcliff is advancing the Sisson Tungsten-Molybdenum Project (Sisson Project) located in New Brunswick; it's near tidewater and easily accessible to markets in the United States, Europe, and elsewhere. Through development of its Sisson Project, Northcliff has the potential to be the largest tungsten producer outside of China; over 80 per cent of global tungsten production currently comes out from China.

Amidst ongoing geopolitical issues, Northcliff's Sisson Project would be a domestic, reliable, and long-term supply of tungsten in a favourable jurisdiction surrounded by existing infrastructure. This supply of tungsten would support the aerospace, defense, heavy manufacturing, technology, and resource industries, and help in the revolution of how energy is generated, stored, and used, all of which advances a green future.

Numerous governments, including those in Canada and the United States, have taken notice of tungsten's importance by designating it as a critical mineral.[5] The European Commission has further recognized tungsten as having the highest economic importance of all raw materials (metals) used in the European Union.[6]

Northcliff's Sisson Project would also be a significant source of molybdenum (Element 42 on the Periodic Table), which has also been designated as a critical mineral in Canada. It has a high melting point (2,623˚C), excellent electrical and thermal conductivity, and high resistance to corrosion.[7] Like tungsten molybdenum has many traditional uses. It is often used as an additive in alloys (steel), catalysts and lubricants (engine use), and pigments (paints and dyes – stabilizer, corrosion inhibitor). In the case of steel alloys, molybdenum is used to increase the steel alloys' durability (wear and tear), strength, electrical conductivity, and resistance to corrosion. Due to its high resistance to corrosion, oxidation, and heat, molybdenum is also used in the production of solar panels.

Recent research on its chemical structure has identified the potential for molybdenum to improve certain capabilities of existing lithium batteries and, as such, it could play a pivotal role in an electrified, green, and digital future. Molybdenum is being used to, potentially, better design cathode / anode hosts in these batteries which, because of the element's inherent conductivity and reactivity towards lithium polysulfides (LiPSs), could modify the battery's overall performance.[8] Moreover, the molybdenum-based materials' tunable crystal structure, adjustable composition, and variable valence show strong indications to further improve a potential alternative to lithium-ion batteries.

In my view, the successful development of any mineral project is reliant on working collaboratively with government, but the success of critical metals projects – those with a pervasive impact on global development in a way to advance green transition goals in a timely way – is also reliant on the support of government.

Northcliff's Sisson Project would create a reliable near-term supply of two critical minerals, providing valuable commodities to end-users in North America and globally, while also advancing the green transition. Having received all its major provincial and federal governmental permits, the feasibility level project is currently being advanced towards construction.

Additional details can be found at www.northcliffresources.com/blogs. M

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