

# BacTech Environmental Announces Filing of Bioleaching Process Patent Application for Green Iron and Nickel-Cobalt Recovery

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## Novel Process for Bioleaching Pyrrhotite Tailings Using Natural Bacteria Holds Zero-Carbon Potential for Green Steel and EV Battery Metal Applications

TORONTO, April 7, 2022 - [BacTech Environmental Corp.](#) (CSE:BAC), (OTC:BCCEF), (FSE:0BT1) ("BacTech" or the "Company"), a commercially proven environmental technology company delivering effective and eco-friendly bioleaching and remediation solutions, today announces it has filed a patent application for a novel bioleaching process relevant to the treatment of pyrrhotite tailings for iron and nickel-cobalt recovery as global leaders and sustainability experts search for solutions to decarbonize steel production and shore up EV battery metal supply chains.

Pyrrhotite is an iron sulphide mineral containing low levels of nickel, cobalt, and copper -- typically dismissed and discarded as an uneconomical waste by-product by mining operations that continues to perpetuate an environmental tailings legacy in need of remediation. In the Sudbury basin of Ontario, there is a vast resource of ~0.8% Ni-bearing pyrrhotite tailings, which has been disposed of separately in shallow lakes since the early 1990s in compliance with known environmental and sustainable development standards.<sup>2</sup> An average grade of 0.7% nickel translates to half a million tonnes of nickel metal<sup>3</sup>, valued at US\$15B (assuming market prices of \$30,000/tonne for nickel).

The Company's new R&D pursuits radically differ from other technical groups' attempts to commercialize pyrrhotite tails treatment that have traditionally focussed on reducing the cost of nickel recovery to create favourable economics. Alternatively, BacTech has been pursuing a scientific path to develop an innovative zero-carbon liberation and extraction approach to separating iron from its ore, in addition to optimizing nickel-cobalt recovery efforts. Furthermore, an upgraded siliceous residue from bioleaching may be used to produce zero-carbon construction materials incorporating geopolymer technology. BacTech believes its method answers a need raised by the Canadian government and others to accelerate the sustainable extraction and processing of critical minerals from existing mine tailings and invest in domestic EV battery production.

"Global demands for green steel and EV battery metals have simply skyrocketed<sup>1</sup>, as have the calls for mining operations and manufacturers to cut carbon emissions," said Ross Orr, President, and CEO of BacTech. "BacTech is positioned to capitalize on the sustainable resource demand, where we believe our bioleaching solutions can help deliver what many others simply cannot - greater environmental responsibility across the mining and resource sectors that supports increased production in a wide variety of commercial applications. Our world-class scientific and advisory team, which includes Dr. Paul C. Miller and Dr. Nadia Myktyczuk, all maintain key industry and government relationships so that we fully understand stakeholder challenges and what's required to introduce bioleaching to large-scale engineering environments."

Recognizing that sustainable iron and sulphur value management, in addition to nickel-cobalt, represents a far greater overall economic opportunity with strong demand, BacTech's bioleaching process for pyrrhotite tails treatment is believed to offer a number of advantages:

- Production of an elemental sulphur as a saleable commodity;
- Production of a nickel cobalt mixed precipitate or nickel cobalt metals;
- Conversion of iron after bioleaching (now separated from sulphur) into an intermediary for green-steel production;
- Production of construction materials from waste bioleach residues using geopolymers;

- Use of membrane technology for more effective management of acid balance to reduce the requirements for acid neutralisation and waste gypsum production;
- Process versatility to manage variations in pyrrhotite feedstocks; and
- Solutions to environmental challenges and mining site remediation efforts.

"Our aim is to dovetail our proven bioleaching technology with other advanced areas of metallurgical separation and recovery, ultimately improving project economics and creating sustainable products from waste materials, while still meeting all remediation objectives," said Dr. Paul C. Miller, BacTech Vice President, Technology & Engineering. "Over two decades ago BacTech Australia itself operated a continuous pilot plant demonstrating the technical viability of applying bioleaching for pyrrhotite treatment, but also showed that the process economics and singular focus on nickel were unfavourable at that time. Our focus has now shifted to better managing the iron and sulphur values of such feedstocks which represent the major stream flows and costs in a process normally reported as wastes. Clearly, the world has changed to embrace both carbon reduction and an increased need for critical minerals. BacTech now sees the whole playing field and the potential to recover multiple resources from existing pyrrhotite tailings."

A program to optimize research and development will be planned over the next year to further advance the concept and to detail the technical and economic aspects of the process towards commercialization.

#### About the Tenguel - Ponce Enriquez Bioleaching Project

BacTech is planning to build a new owner-operated bioleaching facility in Tenguel, near Ponce Enriquez, Ecuador, in a region where arsenic is associated with gold ore (Arsenopyrite). The Company's plan is to build a 50 tpd bioleach plant capable of treating high gold/arsenic material. A 50 tpd plant, processing feed of 1.75 ounces of gold per tonne, similar to feeds available to the Company from local miners, would produce approximately 31,000 ounces per year. Plant designs are modular and can be expanded without affecting ongoing production. The total concentrate market in the Ponce Enriquez area is estimated to be between 200 and 250 tonnes per day, allowing for increased throughput potential with a larger plant.

#### Key economic highlights:

- Pre-tax NPV (Net Present Value with 5% discount rate) of \$60.7M
- Pre-tax IRR (Internal Rate of Return) of 57.9%
- Annual Gold Production of 30,900 ounces
- Capital Cost of \$17M
- Bioleach Operating Cost of \$212 per tonne
- Assumed Purchase Prices of Concentrate - 65% of the contained gold value
- Pre-tax Earnings Prior to Employee Bonus - \$10.9M annually
- Estimated local employee bonus pool - \$1.64M
- Payback (70% DEBT) - 2 years

In total, there are over 90 small mines operating in the area. BacTech intends to return local miner compensation back to previous payment levels, prior to a sweeping price reduction imposed by Chinese buyers due to recent import levies on arsenic/gold concentrates entering China. BacTech continues to investigate the prospects of establishing additional modern bioleaching facilities across other areas of Ecuador, Peru, and Colombia. Where possible, the Company will partner with national and local governments, non-governmental organizations (NGOs) and others to assist with the funding of these projects and ensure that they meet the Company's high expectations not only for environmental standards, but also for the highest standards in all ESG considerations.

## About BacTech Environmental Corporation

BacTech is a proven environmental technology company, delivering effective and eco-friendly bioleaching and remediation solutions to commercial operations to process and recover preferred metals (gold, silver, cobalt, and copper) smartly and safely remove and transform harmful contaminants like arsenic into benign EPA-approved products for landfill. Tapping into numerous environmental and economic advantages of its proprietary method of bioleaching, BacTech uses naturally occurring bacteria, harmless to both humans and the environment, to neutralize toxic mining sites with high-pay potential. BacTech is publicly traded on the CSE under the symbol "BAC"; on the OTC as "BCCEF"; and the Frankfurt Stock Exchange as "0BT1".

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## Special Note Regarding Forward-Looking Statements

This news release contains "forward-looking information", which may include, but is not limited to, statements with respect to future tailings sites, sampling or other investigations of tailing sites, the Company's ability to make use of infrastructure around tailings sites or operating performance of the Company and its projects. Often, but not always, forward-looking statements can be identified using words such as "plans", "expects", "is expected", "budget", "scheduled", "estimates", "forecasts", "intends", "anticipates", or believes" or variations (including negative variations) of such words and phrases, or state that certain actions, events or results "may", "could", "would", "might" or "will" be taken, occur or be achieved. Forward-looking statements involve known and unknown risks, uncertainties and other factors which may cause the actual results, performance, or achievements of the Company to be materially different from any future results, performance or achievements expressed or implied by the forward-looking statements. Forward-looking statements contained herein are made as of the date of this news release and the Company disclaims, other than as required by law, any obligation to update any forward-looking statements whether because of new information, results, future events, circumstances, or if management's estimates or opinions should change, or otherwise. There can be no assurance that forward-looking statements will prove to be accurate, as actual results and future events could differ materially from those anticipated in such statements. Accordingly, the

reader is cautioned not to place undue reliance on forward-looking statements.

Shares outstanding: 163,805,558

The Canadian Securities Exchange (CSE) has not reviewed and does not accept responsibility for the adequacy or the accuracy of the contents of this release.

This press release does not constitute an offer to sell or a solicitation of an offer to buy any of the shares, nor is it a solicitation of interest from a prospective investor.

Sources:

1<https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions/mineral-requirements-for-clean-ene>

2<https://www.sciencedirect.com/science/article/abs/pii/S0892687510002827>

3[https://www.researchgate.net/profile/SrinathGarg/publication/305043776\\_MINERALOGICAL\\_CHARACTERIZATION\\_](https://www.researchgate.net/profile/SrinathGarg/publication/305043776_MINERALOGICAL_CHARACTERIZATION_)

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