

Klean Industries Transforms Recovered Carbon Black into Recovered Carbon Graphite

China Restricts Key Battery Material Exports, Boosting Sustainable Substitutes like Recovered Carbon Graphite Transformed from Recovered Carbon Black

VANCOUVER, BRITISH COLUMBIA, CANADA, November 30, 2023 /EINPresswire.com/ -- Klean Industries Inc ("Klean"), a leading equipment manufacturer and project developer with [know-how focused on the recovery of clean energy and resources from waste](#), is pleased to announce that joint efforts with its partners in Asia are paving the way toward creating sustainable and synthetic substitutes with new innovations that can transform recovered carbon black ("rCB") into recovered carbon graphite at a time when China is tightening exports of key battery materials.



Driving innovation in industries that desperately need sustainability and circularity is what we do best at Klean Industries. We are closing the loop while generating zero waste to landfill."

*Jesse Klinkhamer, CEO of
Klean Industries Inc*

The planet is at a pivotal point in human history, and since the mid-1960s, the portfolio of technologies and solutions offered by Klean Industries has undergone a series of

tests, updates, and improvements. The Company has been constantly seeking new applications for these commercially proven and proprietary technologies which employ both catalytic and non-catalytic processes to transform pyrolysis and gasification into low-temperature, low-cost, small-footprint, high-volume, energy-efficient technologies that effectively eliminate the environmental hazards of today's waste streams while at the same time producing highly value commodities and energy.

In a significant development that has global implications for the electric vehicle ("EV") and renewable energy industries, China has recently announced stringent export restrictions on key battery materials, creating an urgent need for sustainable and synthetic substitutes. One promising solution on the horizon is the conversion of recovered carbon black into recovered carbon graphite.

On October 20, 2023, China, the world's top graphite producer and exporter announced the requirement of permits for the export of some graphite products. This move is a bid to control the critical supply and to show their dominance of virtually 90% of the world's graphite which is used in virtually all EV batteries.

China's decision to tighten export controls on crucial battery materials like graphite, lithium, cobalt, and rare earth elements has sent shockwaves through the global market. These materials are essential for the production of lithium-ion batteries, which power the EV revolution and renewable energy storage systems.

This move has motivated mining companies outside of China to ramp up graphite projects as well as intensify efforts to find graphite alternatives. EV sales continue to rise, and this has EV automakers looking to lock in supplies from outside of China.

This move by China underscores the growing concerns over resource scarcity and environmental sustainability. While the restrictions are expected to impact the supply chain for batteries, it also opens up opportunities for innovation and the development of more environmentally friendly alternatives.

A number of industry-leading insiders have stated that China has begun its shift away from natural graphite mining in an effort to protect the environment and has moved into the production of synthetic graphite. Natural graphite and synthetic graphite are both forms of carbon, but they have different origins, properties, and applications. Synthetic graphite has excellent thermal and conductive properties due largely to its highly ordered, crystalline structure which results in consistent properties when applied to high-tech applications like lithium-ion batteries, semiconductors, and aerospace components. The costs associated with synthetic graphite remain higher than that of natural graphite due to the complex processes required to produce it.

As the global energy landscape evolves, finding sustainable substitutes for critical battery materials is paramount. The Chinese export restrictions, while challenging, serve as a catalyst for innovation and collaboration across the international community. The adoption of solutions like recovered carbon graphite is an encouraging step towards a more sustainable and resource-efficient future.

Over the past decade, process technologies have made leaps forward in sustainability and significant milestones have been achieved in the pursuit of cleaner more efficient technologies to produce synthetic graphite. The recycling of carbon-rich materials including industrial waste, such as end-of-life tires, and other carbonaceous materials is pioneering the approach of addressing the growing challenge of producing synthetic graphite aligning global efforts to reduce greenhouse gas emissions and combat climate change, especially within the drive to decarbonize the automotive and logistics industries with respect to vehicle electrification.

China has committed to reaching net-zero emissions by 2060 while remaining the world's largest industrial manufacturer and the world's largest polluter of the environment. The USA and Europe aim to be net-zero/carbon-neutral by 2050 opening the possibilities for even more production of sustainable recovered carbon black and recovered carbon graphite Companies

and research institutions around the world are actively exploring ways to scale up the production of recovered carbon graphite and integrate it into battery manufacturing processes. This emerging field holds the promise of creating a greener, more ethical, and more sustainable battery industry, helping to reduce our reliance on traditional, resource-intensive materials.

Recovered carbon graphite presents a promising solution. Traditionally, graphite has been a significant component in the anode of lithium-ion batteries. However, the mining and processing of natural graphite have raised environmental and ethical concerns, including the release of carbon emissions and exploitation of mining labor.

Over the course of the past decade, [Klean Industries has undergone a series of technology evaluations](#) and equipment configuration and process upgrades using intellectual properties developed both in-house and with its partners in Japan and China. The KleanTeam has also completed several case studies that analyzed and pilot-tested the use of its advanced thermal conversion technologies that focus on the utilization of pyrolysis and gasification processes within its intellectual property portfolio. Ironically, these key technologies were originally designed specifically for use in processing end-of-life tires as a primary feedstock to create high-quality recovered carbon black (“rCB”) has shown some very impressive results. Klean has 5 thermal processing platforms that use different reactor technologies that are highly sophisticated which has provided the basis of its technology platforms and enabled Klean and its partners to create what the Company believes is a massive breakthrough in product development.

The Company and its partners have been testing various methodologies combined with unique multistage thermal processes that have been combined with a catalyst. This coupling of technology and innovation in catalysts has resulted in some amazing results and has produced both a cost-effective equipment configuration and unique product output. The Company now believes these innovative trade secrets enable recovered carbon blacks to be converted to high-purity graphite that can be used in battery applications for energy storage and electric vehicle mobility.

This new approach of converting lower-quality recovered carbon blacks into highly valued recovered carbon graphite (“rCG”) increases the value of rCB from approximately US \$1,500 per metric tonne to approximately US \$7,000 per metric ton in basic battery applications. Once proven this new process could also be suitable to be used in new high-energy capacitor-based applications where the potential price of the recovered carbon graphite can be estimated to be US \$20,000 a metric tonne. As a result of the above the Company is also exploring the graphene output potential that is showing promise in various applications.

As a parallel path, the Company is also integrating advanced material recovery processes developed in the mining and material handling industry which are used in traditional e-waste recycling systems to include recovered carbon graphite that is derived from repurposed materials like discarded lithium-ion batteries, further addressing both environmental and

resource concerns. In particular, the blending conversion of recovered materials with the reactivation of recovered carbon graphite has gained even more attention due to its potential to both reduce waste and resource depletion in symbiosis. Key advantages of the recovered carbon graphite solution include:

*** Environmental Sustainability:

The use of recovered carbon black significantly reduces the environmental footprint compared to traditional mining and graphite production processes.

*** Resource Efficiency:

Repurposing materials like carbon black conserves valuable resources and decreases the need for new mining operations.

*** Ethical Considerations:

Reduced reliance on graphite mining helps minimize labor exploitation concerns in the graphite supply chain.

*** Circular Economy:

Embracing recovered carbon graphite aligns with the principles of a circular economy, where waste materials are transformed into valuable resources.

*** Energy Transition Support:

By providing an alternative source of graphite for batteries, this solution supports the transition to cleaner energy technologies, such as EVs and renewable energy storage systems.

This innovation comes at a time when the global automotive sector is transitioning to electric mobility to reduce reliance on fossil fuels and decrease emissions. The Company believes that the potential introduction of recovered carbon graphite further illustrates that Klean Industries is positioned as a pioneer in providing more eco-friendly and efficient solutions to the electric mobility marketplace.

Led by circular economic policies, Europe and North America have the potential to increase the utilization of end-of-life tires using advanced thermal processing technologies such as pyrolysis and gasification to produce valuable recovered carbon black ("rCB") and even more valuable recovered carbon graphite ("rCG"). The end result would enable the decarbonization of the global economy to happen at a greater rate of speed and further enhance the circular economy.

Creating recovered carbon graphite, a sustainable and marketable commodity from recovered carbon black, offers another critical step forward as a solution in closing the loop for synthetic graphite producers. Repurposing valuable carbon-based materials into the battery market reduces costs, and mitigates the carbon footprint and the environmental impact associated with battery production and the industry as a whole.

The benefits of rCG extend far beyond the EV sector, as recovered carbon graphite has the potential to impact various energy storage applications and industries striving for more sustainable practices.

[About Klean Industries](#)

Klean Industries (“Klean”) provides best-in-class technologies and solutions in the waste-to-value industry. Our international team of award-winning experts has decades of experience in the design, engineering, and manufacturing of the highest-quality equipment to convert waste streams into valuable energy and resources. Our unique products and services are a result of combined knowledge in the design of recycling, resource recovery, waste management, and power generation projects. Our global project management expertise safeguards timelines and budgets enabling projects to be delivered in less time and at lower costs.

Klean uses proprietary technologies to rapidly develop projects that produce the highest quality fuels, recovered carbon blacks, and green hydrogen from various kinds of feedstocks. Our know-how and technical skills provide a specialization in building projects that use advanced thermal technologies such as pyrolysis, gasification, and carbonization, which convert end-of-life tires, waste plastics, and municipal solid waste into domestic energy, sustainable commodities, and new cleantech jobs. We create a symbiosis between waste, resources, and energy. By creating a symbiosis between waste, resources, and energy, Klean Industries is the link between the low carbon, circular economy, and the goal of zero waste to landfill.

For more information, visit www.kleanindustries.com.

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