



Origin Materials' Sustainable Carbon Black Blends Meet or Exceed Fossil-Based N660 Performance for Tires and Mechanical Rubber Goods

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Bench-scale results validate Origin's carbon black as high-performance bio-based tire filler which can be blended into mechanical rubber goods and automotive applications

WEST SACRAMENTO, Calif.--(BUSINESS WIRE)--Mar. 30, 2023-- [Origin Materials](https://www.businesswire.com/news/home/20230330005206/en/) ("Origin") (NASDAQ: ORGN, ORGNW), the world's leading carbon negative materials company with a mission to enable the world's transition to sustainable materials, today announced it has produced carbon black blends that perform at or exceed the level of traditional fossil-based carbon black for N660, a widely used and technically demanding performance specification for automotive tires and mechanical rubber goods.

This press release features multimedia. View the full release here: <https://www.businesswire.com/news/home/20230330005206/en/>

The bench-scale achievement validates the potential for Origin's sustainable, bio-based, low-carbon carbon black to be used broadly in the large, rapidly growing global carbon black market. The N660 specification represents a "gold standard" which Origin's blended product has achieved, indicating the potential for widespread adoption of Origin's carbon black not only in N660 applications, but in less technically demanding specifications, as well.

The materials are expected to be highly sought-after within the global carbon black market, which is experiencing a supply shortage and in need of sustainable alternatives to petroleum-based carbon black, in particular for the automotive industry which has made extensive sustainability and net zero commitments.

For tire applications, Origin's sustainable carbon black is expected to be an attractive alternative to reclaimed carbon black since it does not suffer the same performance limitations as reclaimed carbon black and can even exceed the performance of fossil-based materials. Origin's carbon black could help tire manufacturers develop sustainable high-performance products that go beyond the constraints of reclaimed carbon black, which is typically added into fossil carbon black as a 5-10% blend.

The achievement demonstrates the flexibility and transformative potential of Origin's patented technology platform, which can turn the carbon found in sustainable wood residues into useful materials while capturing carbon in the process. In addition to sustainability and performance advantages, Origin's carbon black contains no detectable levels of PAH (polycyclic aromatic hydrocarbons).

"We have made several carbon black blends that meet or exceed the performance of N660, a highly technical carbon black specification, and we look forward to further increasing the proportion of our material in similar blends in the future in a stepwise fashion, typical of carbon black development programs for tires and other applications," said Origin Materials Co-Founder and Co-CEO John Bissell. "Our material is uniquely tunable, meaning we can customize it to meet the needs of customers, including for other grades of carbon black that are far less technically demanding. Factoring in its expected low carbon footprint and the absence of PAHs, Origin's carbon black is a game changer and an attractive alternative to reclaimed carbon black, in particular. I couldn't be prouder of our team and we are excited to continue moving forward in our efforts to decarbonize the world's materials."

Technical Overview

With support from Akron Rubber Development Laboratory, Inc. ("ARDL"), a leading international laboratory for the rubber and plastic industries, Origin performed a study blending Origin's carbon black into traditional fossil-based carbon black for the N660 specification using a standard tire recipe. The stress-strain performance of the blended rubber compound was analyzed (Figure 1). Compared with fossil-based N660 carbon black, blends of up to 10% Origin carbon black showed equivalent or improved performance.

In addition, the study found that, compared with 100% fossil-based carbon black, blends containing Origin's carbon black could achieve superior dispersion and tan delta, qualities which offer performance advantages in tires related to durability and fuel economy.

The results demonstrate the suitability of Origin's carbon black as a bio-based, low-carbon emission filler for diverse applications including the high-performance N660 specification, suggesting broad potential for use in other specifications and applications, as well.

Stress vs Strain

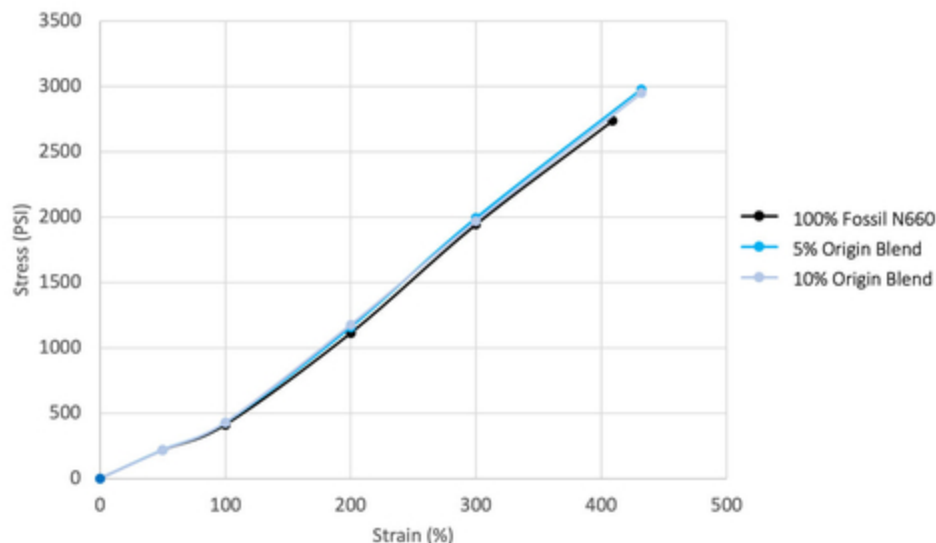


Figure 1 Rubber compounds containing up to 10% Origin carbon black blend showed equivalent or improved performance compared with traditional fossil-based N660 ASTM carbon black under stress-strain analysis. (Graphic: Business Wire)

Origin's carbon black is made by treating HTC (hydrothermal carbon), a unique material produced from Origin's core process and which forms from the interaction of lignin and CMF (chloromethyl furfural) during the conversion of the biomass. Origin's HTC can be tuned to achieve custom performance criteria, including for carbon black, by controlling process conditions and post-processing. Carbon black derived from Origin's HTC is physically similar to fossil-based carbon black, with primary particles clustered into "grapelike" aggregates with complex structure (Figure 2). Compared with fossil-based carbon black, Origin's carbon black offers an enhanced ability to manipulate surface chemistry and morphology, making it a particularly versatile material in addition to offering sustainability and performance benefits.

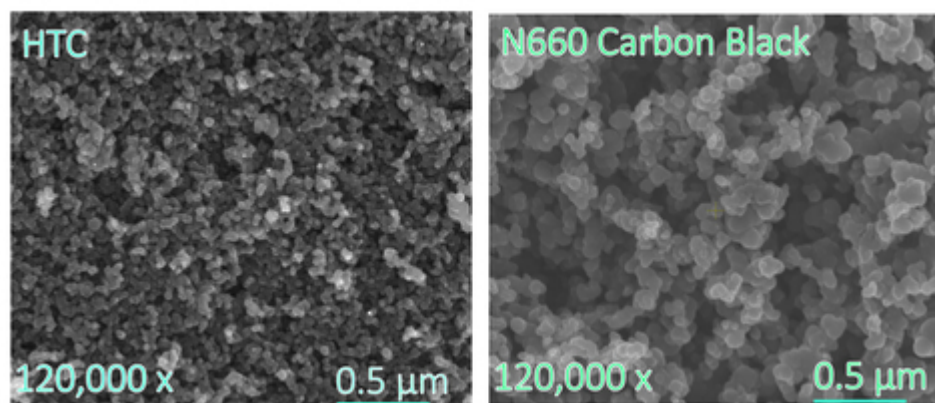


Figure 2 HTC primary particles (left) form as "grapelike" aggregates during the conversion of lignocellulosic biomass to platform intermediates including CMF and HTC. The structure of these aggregates is complex and similar to (right) N660 carbon black derived from oil. (Graphic: Business Wire)

Origin is committed to addressing the most pressing sustainability and performance challenges in the carbon black industry, enabling net zero goals across mechanical rubber goods, automotive, and other applications. For more information, visit <https://www.originmaterials.com/products/carbon-black>.

About Origin Materials

Headquartered in West Sacramento, Origin Materials is the world's leading carbon negative materials company. Origin's mission is to enable the world's transition to sustainable materials. For over a decade, Origin has developed a platform for turning the carbon found in inexpensive, plentiful, non-food biomass such as sustainable wood residues into useful materials while capturing carbon in the process. Origin's patented technology platform can help revolutionize the production of a wide range of end products, including clothing, textiles, plastics, packaging, car parts, tires, carpeting, toys, fuels, and more with a ~\$1 trillion addressable market. In addition, Origin's technology platform is expected to provide stable pricing largely decoupled from the petroleum supply chain, which is exposed to more volatility than supply chains based on sustainable wood residues. Origin's patented drop-in core technology, economics and carbon impact are supported by a growing list of major global customers and investors.

For more information, visit www.originmaterials.com.

Cautionary Note on Forward-Looking Statements

This press release contains certain forward-looking statements within the meaning of the federal securities laws. Forward-looking statements generally are accompanied by words such as “believe,” “may,” “will,” “estimate,” “continue,” “anticipate,” “intend,” “expect,” “should,” “would,” “plan,” “predict,” “potential,” “seem,” “seek,” “future,” “outlook,” and similar expressions that predict or indicate future events or trends or that are not statements of historical matters. These forward-looking statements include, but are not limited to, statements regarding Origin Materials’ business strategy, estimated total addressable market, access to traditional financing sources, budget and timelines to complete Origin 1 and Origin 2, ability to convert capacity reservations and offtake agreements into revenue, ability to enter new end-markets, ability to develop new product categories, commercial and operating plans, product development plans, anticipated growth and projected financial information and ability to realize the anticipated benefits, performance, or rates of adoption of Origin’s carbon black discussed in the press release. These statements are based on various assumptions, whether or not identified in this press release, and on the current expectations of the management of Origin Materials and are not predictions of actual performance. These forward-looking statements are provided for illustrative purposes only and are not intended to serve as, and must not be relied on as, a guarantee, an assurance, a prediction, or a definitive statement of fact or probability. Actual events and circumstances are difficult or impossible to predict and will differ from assumptions. Many actual events and circumstances are beyond the control of Origin Materials. These forward-looking statements are subject to a number of risks and uncertainties, including that Origin Materials may be unable to successfully commercialize its products; the effects of competition on Origin Materials’ business; the uncertainty of the projected financial information with respect to Origin; disruptions and other impacts to Origin’s business as a result of outbreaks such as the COVID-19 pandemic, Russia’s military intervention in Ukraine, the impact of severe weather events, and other global health or economic crises; changes in customer demand; and those factors discussed in the Annual Report on Form 10-K filed with the U.S. Securities and Exchange Commission on February 23, 2023 under the heading “Risk Factors,” and other documents Origin Materials has filed, or will file, with the SEC. If any of these risks materialize or our assumptions prove incorrect, actual results could differ materially from the results implied by these forward-looking statements. There may be additional risks that Origin Materials presently does not know, or that Origin Materials currently believes are immaterial, that could also cause actual results to differ from those contained in the forward-looking statements. In addition, forward-looking statements reflect Origin Materials’ expectations, plans, or forecasts of future events and views as of the date of this press release. Origin Materials anticipates that subsequent events and developments will cause its assessments to change. However, while Origin Materials may elect to update these forward-looking statements at some point in the future, Origin Materials specifically disclaim any obligation to do so. These forward-looking statements should not be relied upon as representing Origin Materials’ assessments of any date subsequent to the date of this press release. Accordingly, undue reliance should not be placed upon the forward-looking statements.

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