No Small Feat: Rhode Island Plays Host to Nanotechnology Breakthrough

Graphene Composites (GC) is a world leader in nanomaterials engineering. With roots that extend from the United Kingdom to Providence, Rhode Island, the team applies its nanotechnology expertise to a wide range of applications and technical challenges, developing revolutionary solutions in health, protection, composites, and energy industries.

Led by former Rhode Islander Sandy Chen, CEO, and Dr. Steve Devine, CTO, GC developed one of their best-known products: the GC Shield™. Using the latest in nanomaterials enginering, GC developed a unique and lightweight ballistic shield that offers bullet and stab protection with effective force dispersion at only half the weight of conventional shields. This advanced technology far exceeds protection standards for law enforcement, first responders, and military personnel and has the proven ability to stop multiple rounds of many types of ammunition at close range.

Sandy Chen
CEO & Co-Founder
Graphene Composites

Looking beyond the success of GC Shield, the GC team continued to grow and started to look ahead to not only leading the next industrial revolution in composites but doing so right here in Rhode Island, where Chen has roots as a Brown University alum.

"We believe this next industrial revolution in Rhode Island has the potential to make the same kind of impact that the Silicon Valley movement spurred in California," said Chen, "indeed, Rhode Island was at the center of America's first industrial revolution, started by Samuel Slater who set up the first US textile mills in Pawtucket and Slatersville.

"Nanomaterials engineering is truly at the cutting edge of technology," said Dr. Devine, "and delivering real-world products from these technologies is a challenge that the GC Team and our partners embrace."

Passionately committed to executing this broad strategy in Rhode Island, the GC Team sought collaboration and a shared vision from stakeholders in the Ocean State to pave the way forward.

Steve Devine
Chief Technology Officer
Graphene Composites

REALIZING POTENTIAL FOR ALL

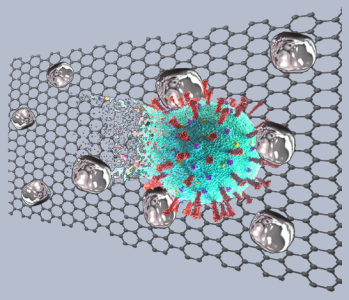
As GC started to build inroads in Rhode Island, the global pandemic hit. The GC team quickly pivoted, shifting its focus onto how to apply nanomaterials engineering to win the fight against COVID-19. Spurred by a grant from the Rhode Island Commerce Corporation to support testing, Chen and his team leveraged a graphene oxide formulation they had been working on with colleagues at Brown University to prevent mosquito bites, reformulating it to kill coronavirus, thus GC Ink™ was born.

"Having the support of the State of Rhode Island, led by then Governor Raimondo, was invaluable," said Chen. "GC Ink can – and will – have a major positive impact on this pandemic – and Rhode Island's continued leadership will be a crucial enabler in this."

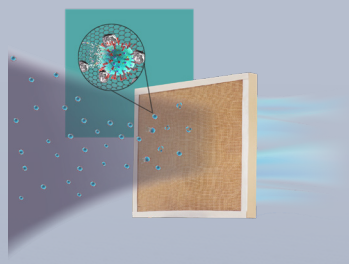
BROWN

How does it work? GC Ink is a formulation that forms an antimicrobial coating that attacks the virus. On a nanoscale, GC Ink has a dual-action "trap-and-kill" effect where two nanomaterials – graphene oxide and silver nanoparticles – work together, providing long-lasting protection against viruses and bacteria.

When applied to air filters, GC Ink significantly reduces viral and bacterial loads, without the need for costly retrofitting. GC Ink can be coated onto any type of cellulosic pre-filter material to kill the virus through ventilation solutions, and it can be coated onto a host of other materials to create new products or enhance the safety of existing product ranges.

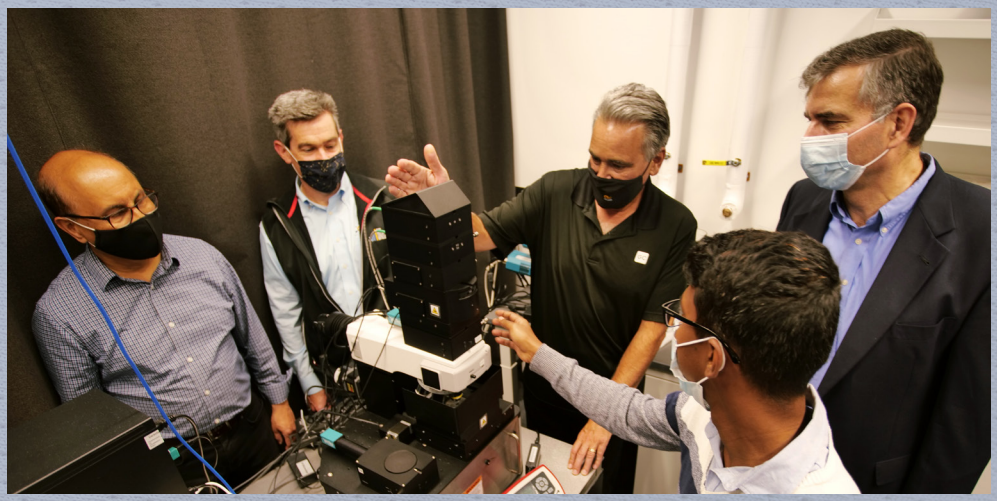


An independent study with Brown University found that GC Ink in liquid form is 100 percent effective at neutralizing coronavirus and influenza viruses in under one minute. When used on filter materials, it has at least 99% virucidal efficacy against SARS-CoV-2, the virus that causes Covd-19, according to ISO 18184:2019, a standard protocol to quantify the antiviral properties of textile materials.



After a year of testing, collaboration, and certification, with production well underway in the UK, GC was anxious to take GC Ink to the next level to produce and commercialize the technology at scale – here in Rhode Island.

"Compressing three years' of R&D into one year in the midst of the pandemic was no small feat," said Dr. Devine, "but now we have shifted our focus to delivering our GC Ink technology in real products like air filters - to help fight not only this pandemic but a much broader range of viruses, bacteria and fungi."



(L to R) Dr. Arijit Bost, Distinguished Engineering Professor, Chemical Engineering; Christian Cowan, Executive Director, 401 Tech Bridge; John Pagliarini, President, GC USA, Graphene Composites; Mox Weber, Vice President, Products, Graphene Composites; and Md Golam Jakaria, PhD student, University of Rhode Island.

ACCELERATING SPEED TO MARKET WITH 401 TECH BRIDGE

GC's relationship with 401 Tech Bridge began at the start of the pandemic. In early 2020, GC participated in the Rhode Island Mass Challenge accelerator program, working with RIHub – a non-profit, venture mentoring service based in Providence. GC went on to win the Challenge's Platinum Award and $75,000, after which it promptly set to work with 401 Tech Bridge to make commercialization of GC Ink not only possible, but also attainable in Rhode Island.

Building on Chen's Rhode Island roots, GC wanted to establish startup operations in the US, specifically in the Ocean State. Moreover, beyond the production of their own products, the GC team sees Rhode Island's potential to be a leader in the advanced materials and technologies, a hub of innovation that could see the next revolution in workforce development for a variety of industries, including theirs.

To set up shop in the state, GC needed support, expertise and resources, and the firm has worked with 401 Tech Bridge to secure equipment, personnel, and industry know-how to establish commercial operations. 401 Tech Bridge advisors used their connection with the University of Rhode Island (URI) College of Engineering to develop a partnership between university faculty and students with the GC team to produce GC Ink at scale in campus engineering labs. This connection made by 401 Tech Bridge has proved to be a win for all parties involved, providing experiential learning to engineering students as well as successful replication of the GC Ink production process here in Rhode Island.

"Without funding from the Rhode Island Commerce Corporation and the deep experience and connections of 401 Tech Bridge, it would have taken much longer for GC Ink to reach production scale, and we would not be aligned with the specific resources we now have here in the U.S.," said Mox Weber, GC's Vice President, Products. "If it was not for these resources, we would probably still be only making GC Ink in the UK."

Parallel to this initiative and in a partnership with nanotechnologies leader, Haydale, 401 Tech Bridge obtained an HT200 Plasma Reactor with the goal of providing advanced materials support for the innovation ecosystem at large in the region. The reactor will be housed in the new 401 Tech Bridge Advanced Materials and Technology Center slated to open in 2022.

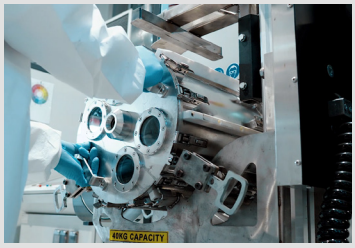
"Being a part of the 401 Techbridge innovation ecosystem will give Graphene Composites the ability to collaborate with other tenants and customers pursuing open innovation" said Devine. "The ability to collaborate with a range of industries and supply chains will increase the probability of developing new innovative products and services for exploitation in the Rhode Island area and beyond."

MASSCHALLENGE

RIHUB

THE UNIVERSITY OF RHODE ISLAND

Mox Weber
Vice President, Products
Graphene Composites



A BRIGHT FUTURE

Both GC and 401 Tech Bridge recognize the opportunity that lies ahead with the commercialization of a breakthrough product like GC Ink.

"With the production of GC Ink here in Rhode Island, the smallest state in the union could play a very large role in eliminating COVID-19 worldwide especially as we roll out commercialization of the product with our global partners across the US, Europe and SE Asia – the opportunity for Rhode Island will be significant," said Chen.

With that in mind, the Rhode Island Commerce Corporation is supporting an initiative to allow its potentially life-saving GC Ink product to be submitted to the EPA for review to allow its emergency use in the state. This will allow GC to continue collaborating with URI to produce the virus-mitigating, nanotechnology and accelerate the speed to market, with this valuable technology.

The GC and 401 Tech Bridge teams are looking forward to eventually moving production of GC Ink and other GC technology to the new Advanced Materials and Technology Center anticipated to open sometime in 2022 in Portsmouth, RI. With its opening will come the commissioning and availability of the plasma reactor, which will accelerate the adoption of nanotechnology in Rhode Island and beyond.

"Installing the Haydale equipment in the 401 Tech Bridge Advanced Materials & Technology Center will make it available to companies that are doing advanced materials research, enabling innovation and economic growth," said Christian Cowan, executive director of 401 Tech Bridge.

The plasma reactor will be just a small piece of what the center will contribute to the local innovation landscape. The facility will offer meeting, training, lab and equipment space for industry, government, and academic partners to collaboratively problem-solve, develop concepts, build and test prototypes, and present solution...and maybe, discover the next breakthrough technology – like GC Ink – to spark the next industrial revolution, right here in Rhode Island.

"With the production of GC Ink here in Rhode Island, the smallest state in the union could play a very large role in eliminating COVID-19 worldwide..."

Christian Cowan
Executive Director
401 Tech Bridge

ABOUT 401 TECH BRIDGE

401 Tech Bridge accelerates the journey from concept to prototype to commercial scale while creating business opportunities. It facilitates collaboration across industry, government, and academia and leverages the resources and expertise of its vibrant advanced materials and technology ecosystem, which spans industries and activities ranging from infrastructure development and naval research to oceanographic and offshore wind enterprises. 401 Tech Bridge offers meeting, training, lab, and equipment space for industry, government, and academic partners to collaboratively problem-solve, develop concepts, build, and test prototypes, and present solutions. It also connects companies into research divisions at the University of Rhode Island and other universities and institutions across the region, offering facilities for research, prototyping, testing and validation of concepts alongside faculty researchers and students.

The 401 Tech Bridge is a business unit of The University of Rhode Island Research Foundation and serves as a partner intermediary organization for the Naval Undersea Warfare Center Division Newport, supporting the Naval X Northeast Tech Bridge. It receives support from the U.S. Economic Development Administration, the National Institute of Standards and Technology's Manufacturing Extension Partnership (NIST MEP), the Rhode Island Commerce Corporation, The Rhode Island Foundation, and the Van Beuren Charitable Foundation.