Graphene-enhanced Concrete

Concretene is leading the charge in sustainable construction with its graphene-enhanced concrete, a low-carbon alternative that strengthens structures while significantly reducing cement use and CO_2 emissions.

In brief

Concretene, a Manchester-based nanotechnology company, has developed an innovative concrete admixture that incorporates graphene to enhance structural integrity while reducing the amount of cement required. Cement production is responsible for nearly 8% of global CO_2 emissions, but Concretene's approach could cut the embodied carbon of concrete by 20-30%. By ensuring a reliable UK-based supply chain for graphene oxide and graphene nanoplatelets, the company is positioning the UK as a leader in advanced construction materials. The technology has already been trialled in real-world applications, demonstrating its potential to balance economic growth with net-zero commitments.

Stronger, greener, smarter

Concrete is one of the most widely used building materials, but its environmental impact is significant due to the energy-intensive process of cement production. Concretene's patented technology enhances concrete by incorporating graphene – a material said to be 200 times stronger than steel – improving strength and durability while reducing the need for cement. By stabilising the dispersion of graphene nanoplatelets within the concrete mix, Concretene maintains structural performance while requiring less material. This could mean a 20-30% reduction in embodied carbon, extending the lifespan of buildings while reducing overall material consumption.

Scaling up for industry

One of the key challenges for graphene-enhanced concrete is securing a consistent and scalable supply of high-quality graphene. The GRAPHenhance project has addressed these challenges by developing domestic production of graphene oxide and graphene nanoplatelets. William Blythe, a leading UK chemical manufacturer, has tailored graphene oxide for Concretene, while Thomas Swan has optimised graphene nanoplatelet production from sustainable sources to meet future demand. To test its viability on an industrial scale, Concretene conducted a large-scale concrete pour at a farm in Cheshire. This successful trial provided valuable insights into the challenges of integrating graphene into conventional construction workflows, further proving its commercial potential.

Paving the way for a low-carbon future

The introduction of Concretene offers a game-changing opportunity for the construction sector to reduce its carbon footprint without increasing costs. The benefits extend beyond individual projects – wider adoption of the technology could significantly cut CO_2 emissions, reduce reliance on traditional cement production and support a more sustainable construction industry. By leveraging UK supply chains for graphene production, Concretene also strengthens the domestic chemicals sector, reduces dependence on imported materials and positions the UK as a global leader in graphene-enhanced materials.

Neil Witten, Innovate UK's Innovation Lead for Advanced Materials, said: "Emissions from cementitious materials are a major barrier to achieving net zero and must be addressed. Technical solutions must also meet industry requirements and be sustainable. In this project Concretene has simultaneously strengthened the UK supply chain for graphene oxide, progressed product accreditation and demonstrated the benefits of the admixture technology at scale."

Innovation backed by industry support

Concretene's work has been supported by funding from Innovate UK, enabling the company to bridge the gap between lab research and market application. Alan Beck, Concretene's Head of Project Management, emphasised the importance of this support: "It's been a real benefit in helping us move from lab to market. We understand better how to interact with the supply chain, with concrete suppliers, engineers, clients… the people who make it happen. This project has given us insight into how all those pieces fit into place."

With its potential to revolutionise the construction industry, Concretene stands at the forefront of sustainable innovation, proving that cutting-edge technology can go hand in hand with environmental responsibility.

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