

BioConcrete

Beyond Concrete

PRESS RELEASE TEXT**3XN/GXN and Biomason are growing low-carbon Structures with Bacteria
BioConcrete: part of Reset Materials at Copenhagen Contemporary**

The unfolding environmental crisis means that the construction industry needs to find ways of reinventing itself into a circular, low-carbon system that aligns with natural / biogenic processes. One way to develop new solutions in this direction, is to have a granular approach to the materials we use, rethinking their composition to engineer low-carbon alternatives. An obvious candidate is concrete, responsible for up to 8% of the world's emissions of carbon dioxide (CO₂). Due to the heat and chemical processes involved in making cement, concrete embodies a high quantity of carbon and remains the largest CO₂ contributor within the building industry's total emissions.

For some time now, we have been hearing the case against carbon-greedy concrete, and the need to look for alternative construction methods and materials, such as timber. However, due to its affordability and availability, concrete remains a critical means of social and economic development.

BioConcrete is a material innovation project developed between 3XN's independent design-driven research studio, GXN, Biomason, a leading local producer that is revolutionizing commercial cement with biotechnology, and the artist Silas Inoue. The project investigates the applications of Biomason's patented Biocement® technology, one that uses non-modified bacteria to grow a cement-like material that is twenty percent lighter than concrete blocks, yet three times stronger.

BioConcrete brings together an architecture office, a material producer and a local artist, Silas Inoue, to expand the artistic, design, architectural and industrial opportunities that Biocement® presents up to date, in the hope that this will enable environmentally conscious material solutions. The project has been developed as part of a larger exhibition at Copenhagen Contemporary, that investigates ten sustainable building materials of the future. The project has been documented and included in the exhibition's catalogue '*Reset Materials*', edited by curator Chrissie Muhr (2023, Danish Architectural Press). The project reimagines one of the most historic and ordinary of architectural elements, the column, into one fully grown by bacteria with minimal human intervention in only 72 hours.

Sounds like science fiction, so, how exactly does it work? The cement-like material grows by Biomineralization. In this process, bacteria's metabolism carries out a mineral precipitation in the presence of certain chemical substances and environmental conditions. Mineral formations agglomerate the loose pieces of aggregate and forms a strong and firm material reminiscent of concrete.

In this specific project, Microbially-Induced Calcium Carbonate Precipitation (MICP) is carried out by an enzyme-producing bacteria called *Sporosarcina pasteurii*, in the presence of urea and calcium ions (ureolytic biocementation). The process requires significantly fewer energy resources than the manufacturing of cement and concrete does, and aggregates can be natural (sand, soil), or upcycled from the construction industry (glass, concrete, or brick).

*"BioConcrete is more than a project; it's a catalyst for change. says Aleksander Guldager Kongshaug, GXN Associate and Project Lead. "We're not content with isolated innovations—we aim to influence the wider discourse and propel the industry towards market-ready, low-carbon solutions." For Aleksander and the wider team, It's about transforming opportunities into impactful actions. By partnering up with Biomason, and exploring their patented biocement technology, "we're reducing carbon emissions but also creating **opportunities for new tectonic systems that aligns with the principles of the environment in which they are placed.**"*

BioConcrete

Beyond Concrete

With this project, GXN aims to address the current barriers for the wide implementation of concrete alternatives. It is evidence of the studio's methodology, one that supports the roadmap to a circular, low-carbon future through strategic interdisciplinary partnerships. This knowledge enables the studio to bridge the gap between innovation and implementation, driving sustainable change in the building industry.

Facts

BioConcrete is part of "RESET MATERIALS: Towards Sustainable Architecture", an exhibition curated by Chrissie Muhr, and created in a collaboration between Copenhagen Contemporary and the Danish Association of Architects (Akademisk Arkitektforening). The exhibition presents 10 materials that interweave a designer, an artist, and a local producer. GXN, Silas Inoue, and Biomason have created a series of objects and fragments that experiment with bio-cement technology. RESET MATERIALS is supported by the Dreyers Foundation and ran until September 2023.

Team: Lasse Lind, Aleksander Kongshaug, Tandia Hardcastle, Johannes Dickmeiss, and Amaya Steensman (3XN/GXN, Architects), Silas Inoue (artist), Jan Vandersande (Biomason, producer)

GXN Innovation / 3XN Architects: GXN is an independent design-driven research studio that pioneers sustainability within the construction industry. GXN's work has a twofold remit: to join the dots between a healthy planet and human well-being. GXN does this in two ways: they promote a circular future by challenging the way we use and reuse resources in the building industry: and they elevate user experience by placing behavioural research at the centre of their work. GXN was founded by 3XN in 2007 and are currently represented in Copenhagen and London. The studio leverages experience from over 16 years of collaborative design research with leading companies and research environments to advance frameworks for generous and innovative behavioural and circular design.

Silas Inoue (Artist) - Silas Inoue (b.1981 Copenhagen) is an artist graduated from the Royal Danish Academy of Fine Arts Design School in 2010. Inoue has exhibited in Denmark and abroad and has received numerous grants and awards.

Biomason (Jan Vandersande): Biomason was founded in 2012 and is headquartered in Durham, North Carolina, USA. With a steadfast commitment to sustainability, Biomason's cutting-edge Biocement® technology is transforming the construction industry. Unlike traditional Ordinary Portland Cement (OPC), Biocement® is produced using multiple patented processes that incorporate bacteria into a mix of gravel, sand, and nutrients. This revolutionary process eliminates the need for fossil fuel-fired kilns or calcination of limestone, the major sources of carbon emissions in OPC production. Biomason's collaboration with IBF has resulted in the world's first commercial Biocement® factory, located in Ikast, DK, which will cater to the European market's growing demand for eco-friendly construction materials.

For more information on BioConcrete, please contact:

Candela De Bortoli, Communications Assistant, GXN

cbo@3xn.dk

Phone: M +45 9174 8634

Katherine Allen, Head of PR, 3XN

kaa@3xn.dk

Phone: M +45 5370 7082