
CAMBRIDGE ENTEPRISE
SUSTAINABILITY
PORTFOLIO

BAROCAL

By 2075, 50% of London buildings will have fixed cooling systems. While there is little data detailing the levels of air conditioning in homes in England today, best estimates place it around 5%. Worldwide, using AC and electric fans to stay cool accounts for a fifth of all electricity usage in buildings and is expected to increase dramatically.

The Department of Materials Science spin-out, Barocal, is developing a zero global warming potential alternative to fluid refrigerants by harnessing the barocaloric effect in solid refrigerants. This is a move away from the reliance on the compression of greenhouse gases for cooling – and on the combustion of natural gas to provide heating.

We invested in Barocal in 2019 and again in 2022 due to the outsized role that heating and cooling plays in CO2 emissions.

It has since received significant interest, secured £1.3M in funding and been selected as a finalist in the Global Cooling Prize.

Founding Team: Dr Xavier Moya

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CGD™

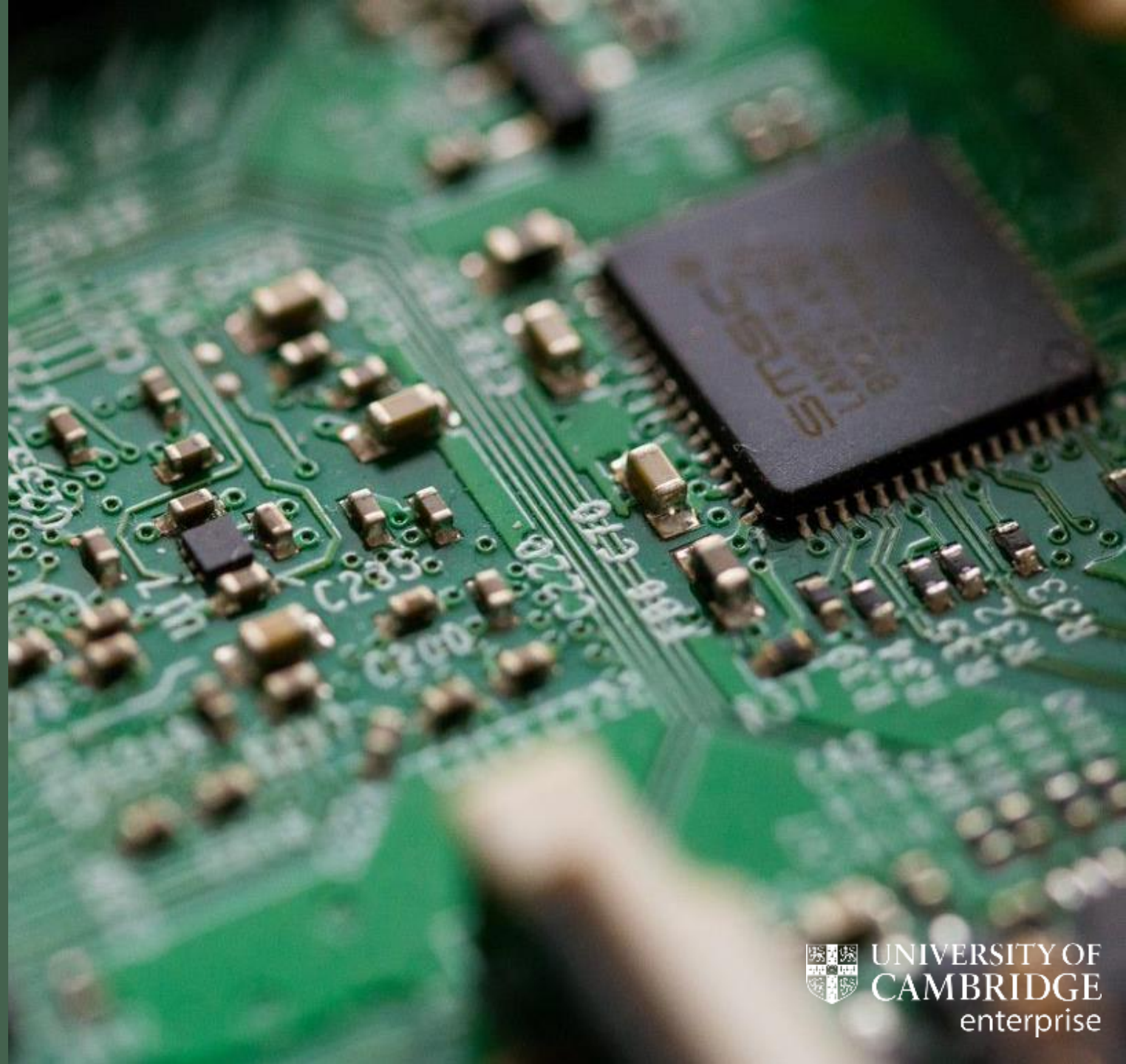
CAMBRIDGE GaN DEVICES

Gallium nitride exceeds the performance capacity of Silicon in speed, temperature, and power handling. It has been earmarked to deliver next-generation power semiconductors with a carbon footprint ten times lower than Silicon chips.

Cambridge GaN Devices, a spin-out from the Department of Engineering, are developing a GaN device which can combine the high efficiency and speed of GaN with the ease of use and high reliability of Silicon. Therefore, the fabless semiconductor company is creating a technology that has the potential to be 5x more energy efficient than current power devices.

Last year, the company raised $19M in Series B funding and signed an agreement with IFP Energies Nouvelles to develop an innovative automotive inverter using advanced GaN devices.

Founding Team: Dr Giorgia Longobardi and Professor Florin Udrea



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CAMBRIDGE PHOTON TECHNOLOGY

Solar panels are a cornerstone of the energy transition, however, a historic pain point in this transition has been efficiency.

Cambridge Photon Technology, coming out of the Department of Physics, is tackling the efficiency problem through its use of photon multiplier materials. By splitting and increasing the number of infrared photons hitting the surface of the solar panel, they are developing a material which can increase the performance of existing silicon solar panels by up to 15%. More efficient panels will ultimately lead to lower costs and fewer space requirements.

In 2019, the company was named a Deep Tech Pioneer in the Hello Tomorrow Global Challenge.

Founding Team: Dr Akshay Rao, Professor Neil Greenham, Professor Richard Friend and Dr Hugo Bronstein

Carbon Re

Emissions from heavy industry are frequently referred to as 'hard to abate', where the technology needed for decarbonisation is still in its infancy or more expensive than in other industries.

Carbon Re, a joint spin-out between the University of Cambridge and University College London, is enabling immediate reductions in emissions by increasing operational efficiencies within the heavy industries. Initially focused on the cement industry, their AI platform utilizes Deep Reinforcement Learning and simulates chemical and physical processes within the operations to create a 'Digital Twin' of the plant. Recommendations can therefore be made to operators to optimize energy use based on the plant's peak performance.

The company recently raised a £4.2M seed round to expand and tackle the gigatonnes of emissions from the cement industry.

Founding Team: Sherif Elsayed-Ali, Buffy Price, Dr Daniel Summerbell and Professor Aidan O'Sullivan

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Colorifix

Consumption within the textile industry has boomed in the past decades, with the amount of clothes bought in the EU per person having increasing 40%. Furthermore, it is reported that the dyeing and treatment of textiles is responsible for 20% of industrial water pollution.

Colorifix, from the Department of Pathology, is using synthetic biology to develop a novel dyeing process. This process incorporates natural colour pigments into a range of fabrics, without the presence of harmful petrochemical dyes. Compared to conventional dyeing steps for cotton, the Colorifix technology reduces water consumption by at least 49%, electricity by 35%, and CO2 emissions by 31%.

In 2022, the company raised a £18M series B round, led by H&M Group, with products launched at H&M and Pangaia.

Founding Team: Dr Orr Yarkoni and Dr James Ajioka

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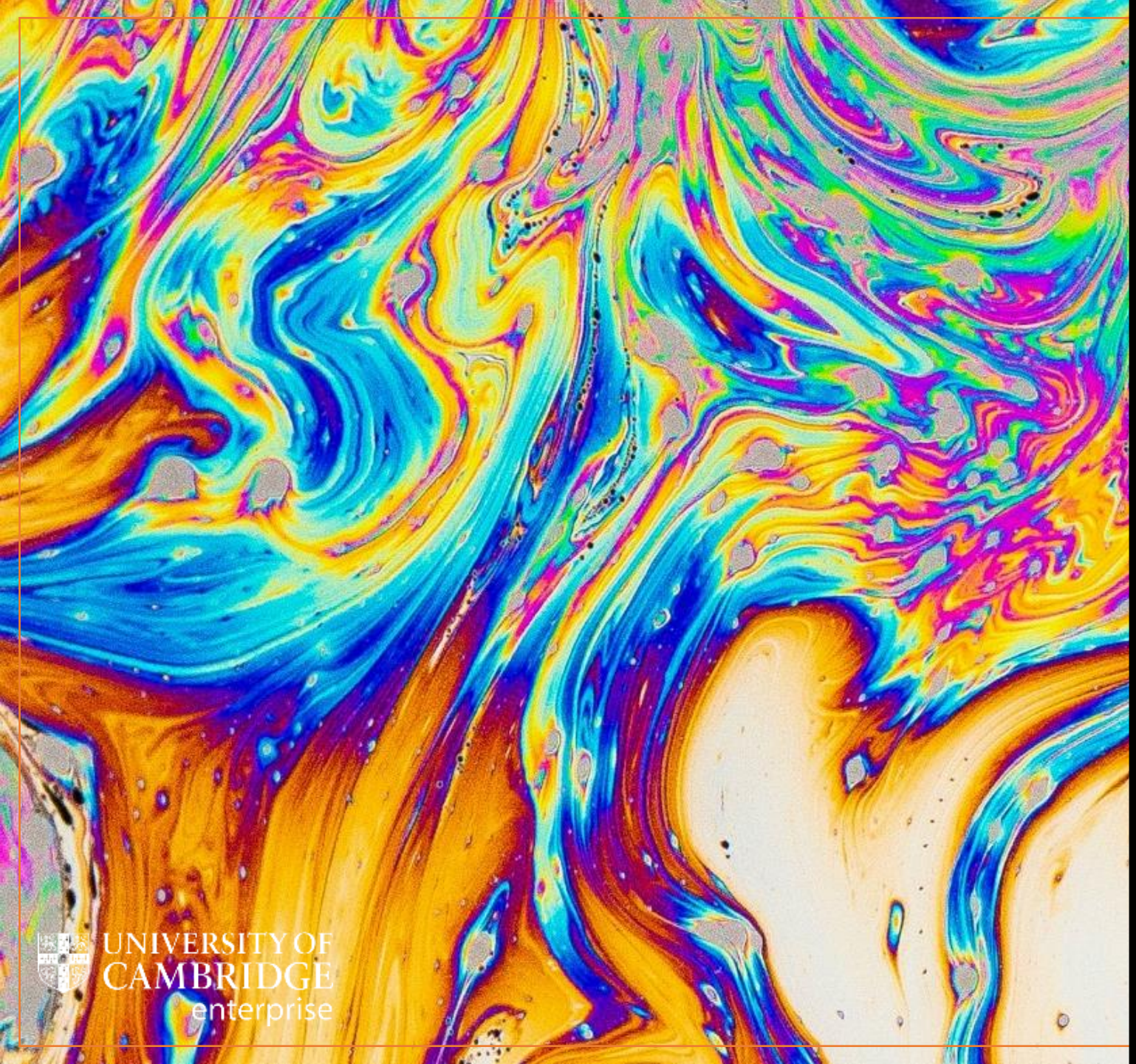

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Sparxell

Effect pigments add shine to and are prevalent across luxury cosmetics, fashion items, packaging, paints, foods, and beverages. They account for 8% of all traded colourants worldwide while containing microplastics, metal and mineral oxides which are harmful to both people and the planet.

Sparxell, coming out of the Department of Chemistry, can produce high value-add pigments by extracting and layering cellulose from cellulose-rich waste streams such as wood pulp. The result is a biodegradable, edible, UV resistant and reflective material that can cover colours from the entire visible light spectra. Compared to colour pigments currently on the market, which produce between 8-22kg CO_2e/kg, Sparxell's solution produces between 0-3kg CO_2e/kg.

The company has won numerous prizes since its inception, including the Trinity Bradfield Prize and Fitzelerate Prize and the 2022 Chris Abell Postdoc Business Plan Competition.

Founding Team: Dr Benjamin Droguet

DeepForm

The car manufacturing industry is a major global polluter. The production of one medium sized car can create as much CO2e as 3 years' worth of gas and electricity in a typical home – 17 tonnes. The industry purchases 12% of steel and 30% of aluminum produced globally, but average material utilization in the industry stands at just 59%.

DeepForm, a spin-out from the University of Cambridge Use Less Lab, have created a manufacturing solution which results in a 75% reduction in trimming scrap and 20% reduction in CO2 emissions from individual car parts. With the added benefit of being able to form tighter corners with reduced risk of splits, product design engineers are granted greater freedom.

In 2021, DeepForm won third place in the Chris Abell Postdoc Business Plan Competition and has since successfully raised a pre seed round.

Founding Team: Dr Christopher Cleaver, Dr Phillipa Horton and Prof Julian Allwood

Echion Technologies

As we transition towards renewable energies, e.g., wind and solar, investment into the development of reliable storage systems is crucial to combat their intermittent nature.

Echion, a spin-out from the Department of Engineering, is creating Lithium-Ion batteries designed with Echion XNO® anode materials. These batteries enable safe, fast charging and discharging capabilities, long life cycles and up to double the energy density of market-leading Lithium-Titanate cells.

In our ongoing move to electrification, the question of effectively storing energy arises for all applications, but none more than sustainable travel. This is highlighted by the booming demand for Lithium-Ion batteries, which is expected to increase 17-fold by 2030.

In 2021, Echion raised a £10M series A round.

Founding Team: Jean de La Verpilliere, Dr Michael De Volder and Dr Adam Boies

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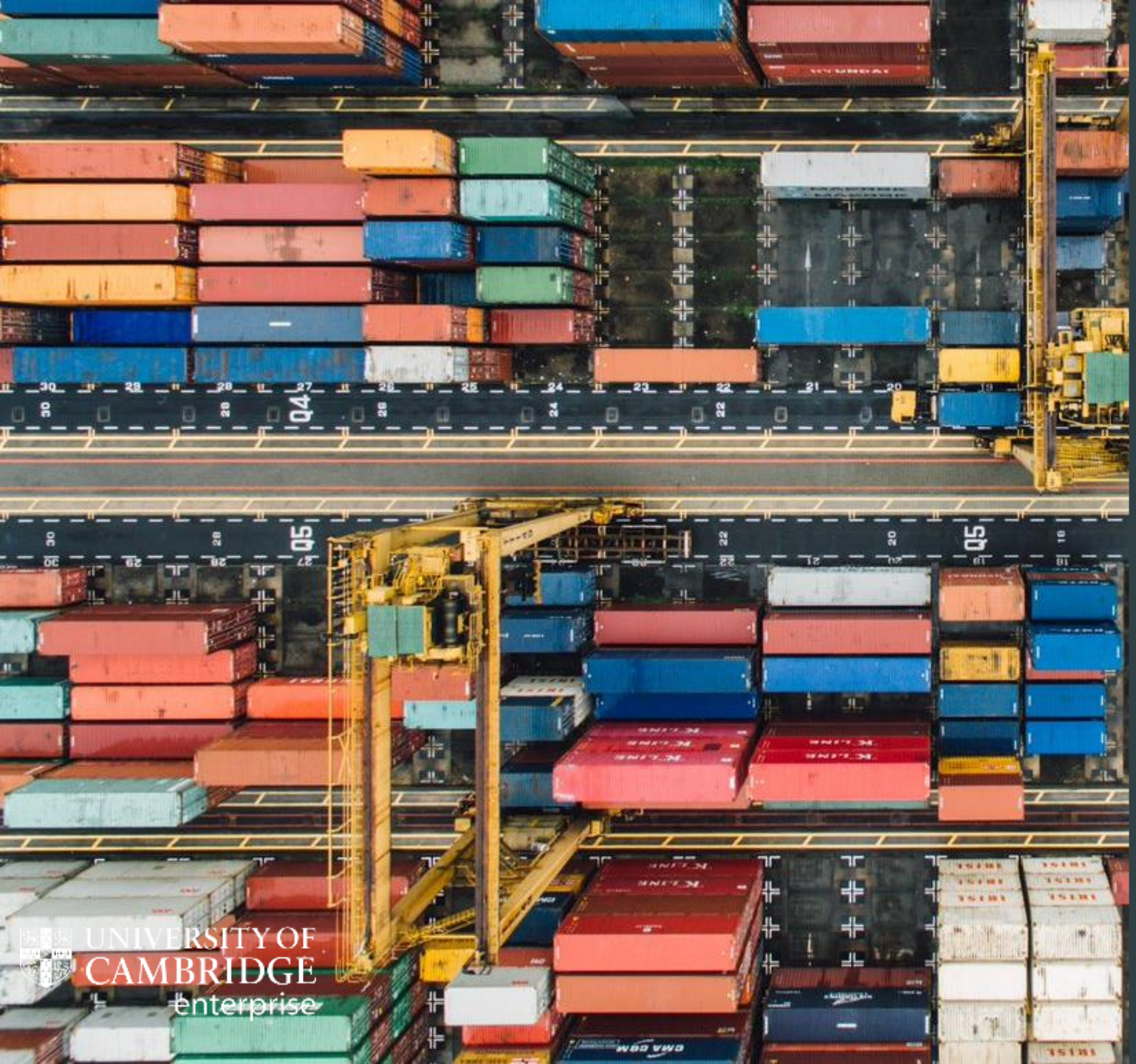
IMPOSSIBLE MATERIALS

Titanium Dioxide is a surprisingly little known, but ubiquitous, white pigment used in numerous applications across plastics, food, cosmetics, paints and pharma. Its inertness in varying environments has allowed it to dominate the market, however, TiO2 nanoparticles are indirectly or directly discharged into agricultural soils creating a new environmental stressor.

Impossible Materials, coming out of the Department of Chemistry, has developed a nature inspired brilliant white pigment. This alternative is made possible by using cellulose which can be extracted from wood pulp waste streams and is an entirely plant-based material. The result is a 75% reduction in carbon dioxide emissions per tonne of product.

At the start of 2023, the company raised a CHF 3.3M Seed round, led by IKEA ventures.

Founding Team: Dr Lukas Schertel and Oliver Polcher



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neutreeno™

Understanding our emissions on a granular scale allows us to make significant reductions. In the summer of 2022, we made a pre-seed investment into Neutreeno, a spin-out from the Department of Engineering, backed by world-leading sustainability experts.

The company is integrating data, climate science and engineering to provide the tools that will enable companies to understand and control their value chain emissions. This comes during a push towards carbon 'insetting', which focuses on avoiding, reducing, and sequestering emissions during upstream and downstream operations. By placing a particular focus on scope 3 emissions, the company strives to reduce the need for offsetting, which typically looks at capturing carbon dioxide elsewhere, by reducing emissions at the source.

Founding Team: Dr Spencer Brennan

nyobolt

Considering our belief that safe and efficient energy storage is imperative for sustainable development, we have invested in not one but two companies innovating battery solutions.

Nyobolt, spun out from the Yusuf Hamied Department of Chemistry, is offering end-to-end ultrafast charging battery solutions. The company is using niobium and tungsten, rather than lithium-ion, which has the potential to enable electric vehicles to charge within minutes. The ability to fast charge addresses a major barrier preventing drivers from switching to electric cars: 'charge anxiety'.

Last year, the company secured $59M in Series B funding in order to build a UK manufacturing plant in 2023 with the intention of producing millions of battery cells.

Founding Team: Professor Dame Clare Grey and Dr Sai Shivareddy

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Xampla

Despite the issue of plastic pollution being firmly ingrained in the public consciousness, with campaigns to reduce consumption and the EU's single-use plastic ban taking effect, UK supermarkets still use 114 billion pieces of single-use plastic a year.

Xampla, a spin-out from the Yusuf Hamied Department of Chemistry, has found a way to provide natural biodegradable alternatives to plastics by manufacturing a range of novel plant-protein materials. These are free from both animal products and synthetic additions. The alternative, synthetic polymers, are not biodegradable, harmful to the environment and increasingly shown to harm human health through the food chain and air.

In December 2022, the company, alongside Gousto, won the SEAL Business Sustainability Awards 'Sustainable Innovation Award' following the launch of the world's first edible stock cube wrapper made from pea protein. To date, the company has raised close to £10M in funding.

Founding Team: Professor Tuomas Knowles and Dr Marc Rodriguez-Garcia