Session 6	Microbes and gaseous feedstocks
Pitch Title	**Using the world's fastest photosynthetic bacteria to turn CO2 into insulin**
Company	CyanoCapture (UK)
Speaker	DAVID KIM
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Keywords technology	CARBON CAPTURE, CYANOBACTERIA, PHOTOSYNTHESIS
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Abstract:

Using the world's fastest photosynthetic bacteria to turn CO2 into insulin

As a planet we produce 39 bn tonnes of CO2 annually. Less than 0.1% of emissions are currently captured. What if CO2 could become a resource not a waste?

In 2020 a fast-growing cyanobacteria was discovered, capable of dividing rapidly and fixing CO2 at an unprecedented rate. Interestingly, these cells are also able to perform post-translational modifications (PTMs) meaning that they are able to correctly fold complex proteins that would otherwise not be possible to synthesise in prokaryotic expression hosts.

In 2021 we began developing molecular toolkits to engineer this fast-growing cyanobacteria. Using markerless cloning, CyanoCapture has engineered a model chassis strain that is thermotolerant, endotoxin-free and able to overexpress shikimate kinase by 200-fold. Using a fusion-cleavage approach, we are able to express in high quantities, complex recombinant proteins that would otherwise not be possible to produce in prokaryotes, at a significantly lower production cost, using only CO2 and sunlight as primary inputs. This breakthrough has opened up significant new possibilities that can make cost-effective protein production achievable using dilute CO2.

Furthermore, the remainder of the biomass is converted to bio-graphite for EV battery anodes, using a proprietary thermal carbonisation technology – achieving durable carbon sequestration in tandem.