Session	Start-ups/SMEs looking for Finance: Series A, Series B/C
Title	One Pot, No Intermediate Isolation: Cell-Free Enzyme Cascades for Low-Cost Bio-Based FDCA
Company	AmphiStar
Speaker	Ortwin Ertl
TRL	TRL 4-7
Keywords feedstock (max 2)	Glucose, sugar
Keywords technology (max 2)	Cell-free biocatalysis
Keywords End-Product (max 2)	FDCA, fructose

Abstract:

Annikki (Graz, Austria) makes the building blocks of bio-based plastics from sugar at lower cost than conventional chemistry, using cell-free enzyme cascades. Several enzymatic steps run in one pot, cofactors are recycled in situ and no intermediate is isolated, eliminating costly, energy-intensive separation steps. Plastic production causes 5.3% of global GHG emissions, about 75% of them before polymerization. Annikki tackles them at the source: the monomer. Fructose, the preferred feedstock for HMF and FDCA, is made in one pot: glucose is oxidized to glucosone and immediately reduced to fructose, with >99% conversion and 99.5% purity. This route has been scaled to 8,000 L (TRL 7). HMF is converted to FDCA with no detectable mono-acids and no organic by-products from HMF, the quality PEF needs. PEF can replace PET and part of PE and PP.

The platform rests on more than €40 m invested in R&D, more than 3,000 redox enzymes and more than 170 granted patents in about 50 families. Cumulative production under Annikki's first license is approaching 1,000 t. Annikki is working on more than a dozen further cell-free redox biocatalysis processes, and the technology is amenable to dozens of products. Annikki licenses its processes; in many cases licensees can use their existing stirred tanks. Annikki earns fees, royalties and enzyme supply. Annikki is raising €20 m to complete FDCA development, scale it up at partners and develop further processes such as MEG.