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Large-scale 3D printing of bio-based and biodegradable materials

Problem definition

The "Bio Formwork" research project is investigating the use of thermoplastic starch (TPS) for non-standardized, single-use concrete formwork in the architecture sector. Two prototypes are on display: (a) a robotically printed formwork made of pure TPS, and (b) a component cast from this formwork using ultra-high-performance fiber-reinforced concrete (UHPFRC). This study explores the potential of TPS as a sustainable material for formwork in digital construction.

Results

The results demonstrate that starch, a biopolymer, can be converted into compostable TPS through a straightforward transformation process involving the application of heat and mechanical stirring with bioplasticizers and solvents. Subsequent mechanical post-processing can be utilized to form the material into pellets. These pellets can then be processed with a Fused Granular Fabrication (FGF) printing method, applying heat and pressure to produce complex three-dimensional objects.

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