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Photofuel - Biocatalytic solar fuels for sustainable mobility in Europe

Deliverable D2.8

## **High yielding, robust octanol biocatalyst for fuel production in WP3**

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<b>Editorial</b>	
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## Publishable Summary

The overall objective of the PHOTOFUEL project is to deliver a sunlight-driven biocatalytic process that generates engine-ready fuel. In order to implement such a commercial process, the productivity of the bioprocess needs to operate at near-maximum efficiency to enable cost-efficient production of competitive biofuel commodities. In Deliverable 2.5, we reported 1-octanol producing strains that achieved 5% carbon-to-product efficiency. Unfortunately, these strains still suffered from genetic instability.

Continuing on from D2.5 and as published (Yunus and Jones, 2018), where we reported a 1-octanol titer of 60 mg/L, the objective in D2.8 was to enhance the overall productivity and stability of the biocatalyst. The work in D2.8 was divided into five separate tasks: (1) Screening for improved variants of enzymes catalyzing bottleneck reaction steps, (2) Co-expression of putative cell membrane efflux transporters, (3) Optimization of cultivation conditions, (4) Reduction of product toxicity and (5) Rational engineering of native central carbon metabolism, all followed by evaluation of productivity and robustness. This yielded the following outcome:

- High-yield conversion of CO<sub>2</sub> into 1-octanol reaching up to 32% carbon-to-product conversion in the best case and a titer of >600 mg/L, a 10-fold improvement.
- Healthier and more productive strains, hence more robust