

# Three Postdoctoral Positions Available

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For the ARPA-E (DOE) funded project entitled:

## Disruptive Technology for Carbon Negative Commodity Biochemicals

Stanford University (in collaboration with Rensselaer Polytechnic Institute (RPI) and BioChemInsights, Inc. (BCI)) seeks to replace carbon- and energy-inefficient fermentation unit operations for commodity chemical production with innovative cell-free processes. Instead of releasing CO<sub>2</sub> into the atmosphere, this new approach will enable utilization of atmospheric CO<sub>2</sub> as well as glucose obtained from cornstarch to produce renewable fuels and chemicals. Succinic acid will be the first product, but the technology will then easily be adapted to produce a broad range of other biochemical products. The new cell-free technology activates a biosynthesis platform that increases conversion rate, energy efficiency, and volumetric productivity to encourage investment in distributed production facilities located in rural communities.

### **Position 1: Enzyme characterization, engineering, and activation.**

The activities and objectives include: 1) purifying and characterizing central pathway enzymes, 2) improving [FeFe]-hydrogenase activation during *E.coli* expression, and 3) evolving various enzymes to improve their functionality in the context of a very high productivity cell-free production process.

### **Position 2: Metabolic Engineering.**

The activities and objectives include: 1) developing assays and approaches to assess detailed pathway performance, 2) preparing and validating a kinetic pathway model, 3) achieving or exceeding conversion yield and productivity targets, and 4) co-developing online process control algorithms.

### **Position 3: BioProcess Engineering.**

The activities and objectives include: 1) developing growth, expression, harvesting, and cell extract preparation protocols, 2) developing improved procedures for co-expression and activation of an [FeFe]-hydrogenase and ferredoxin, 3) developing a durable ultrafiltration protocol for product removal, 4) increasing H<sub>2</sub> mass transfer, 5) building a fully monitored cell-free bioreactor, and 6) co-developing online process control algorithms.

The project is scheduled to begin September 1, 2021. The three postdocs will collaborate with each other as well as researchers at RPI and BCI.