



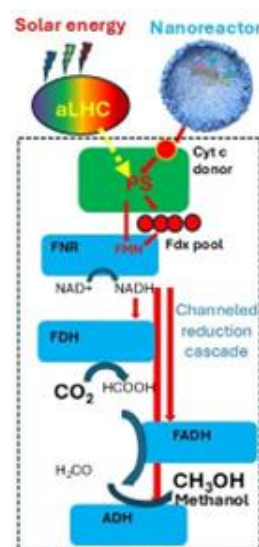
PhD position in Biophysics and Biochemistry

This PhD project is funded by the Czech Science Foundation (GACR project number 26-22037S) as a collaborative award between the groups of Dr. Jakub Psencik at Charles University in Prague (external co-supervisor) and Prof. Roman Tuma (main supervisor) at the University of South Bohemia.

Engineering self-assembling nanoreactors for light-driven chemistry and carbon dioxide capture

Chemical industry is currently one of the most energy demanding sectors that significantly contribute to local pollution and global climate changes. Here we aim to reduce this impact by nanoscale engineering of biodegradable chemical reactors for light-driven reduction of carbon dioxide into common chemical feedstocks such as methanol.

The nanoreactor is based on self-assembling viral capsid into which photosystem I (PSI) will be incorporated together with engineered redox enzymes. The nanoscale confinement provided by the viral capsid will facilitate electron flux between PSI and the redox enzymes and thermodynamically drive efficient reduction of CO₂ to methanol. In the first phase, we will engineer PSI and redox enzymes for bioconjugation and optimize the self-assembly process. The stoichiometry will be optimized for efficient light driven reduction of suitable substrates such as NAD⁺. In the second phase the nanoreactor will be augmented with an artificial LH antenna based on self-assembling bacteriochlorophyll pigment aggregates or quantum dots. Finally, the electron transfer and redox cascade will be optimized for CO₂ reduction.



The project will entail genetic engineering, purification of membrane and redox proteins, self-assembly of nanocontainers and their structural characterization using electron microscopy. The nanoreactors will be functionally characterized by spectro-electrochemical methods and time-resolved optical spectroscopy to determine the rate constants and electron transfer efficiency.

We are seeking students with biochemistry and/or molecular biology background (MSc level) with a keen interest in biotechnology and nanoscience, who are ready to embrace interdisciplinary research. Fluent command of English language is required.

The 4-year project will be carried out in the state of the art laboratories (<http://makrokomplex.cz/>) at the Faculty of Science, University of South Bohemia (<https://www.prf.jcu.cz/en/>) in the beautiful town of [Ceske Budejovice](#), also known as Budweis,



Přírodovědecká
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University of South Bohemia
in České Budějovice

the home of the original Budweiser Budvar beer. The project is a collaboration between our university and [Charles University](#) in [Prague](#) where advanced photophysical and electrochemical characterization of the nanocontainers will be carried out. We also collaborate with laboratories at the [University of Leeds](#) on preparation and utilization of quantum dots and other solid-state nanostructures.

How to apply:

Please send your CV electronically via rtuma@prf.jcu.cz until **March 31, 2026**.

More detailed information here: <http://makrokomplex.cz/new-funded-phd-position-available/>

Lab website: [Makrokomplex – Research consortium: Mechanisms and dynamics of macromolecular complexes](#)

More information about the faculty at www.prf.jcu.cz.