Research content for the short video Cyanobacteria work for industry_ Utopia 2024

"IMAGINE: Cyanobacteria work for industry
... Enabled by replacing chemicals with organic processes for a greener planet"

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Cyanobacteria as green catalysts

In the future, we will have achieved a groundbreaking turnaround in the chemical industry. The heart of this revolution are cyanobacteria, which act as green catalysts and offer an environmentally friendly alternative to traditional chemical processes. Cyanobacteria are able to produce enzymes that are needed to carry out

electron transfers (redox reactions). This makes it possible to carry out complex redox processes efficiently and in an environmentally friendly manner without the need for expensive and environmentally harmful catalysts or energy-intensive conditions.

Of particular note is the production of NADPH, a molecule that is widely distributed in nature and can power many different redox reactions. Research has found a way to effectively recycle this expensive molecule by using cyanobacteria, which are able to recycle NADPH directly from water using light energy, resulting in oxygen as the only waste product.

Integration into industrial processes

In our utopia, these genetically optimized cyanobacteria are used on a large scale to catalyze a variety of chemical reactions in a way that is both economically and ecologically sustainable. They enable the production of pharmaceuticals, plastics and many other important chemicals without the environmentally damaging side effects associated with traditional methods.

Another key advantage of this technology is its ability to be stereoselective, which means that they can specifically produce one of the two mirror images of a molecule. This

This precision is particularly invaluable in the pharmaceutical industry, where the wrong isomer of a drug can have harmful effects. The ability to specifically produce the desired form of a molecule is revolutionizing drug manufacturing, facilitating the safe and effective production of new therapies. The integration of cyanobacteria into industrial processes has not only transformed chemical production, but has also established a new sector of green technologies based on the coexistence of

industrial development and environmental protection. Industrial plants that were once among the biggest polluters are now pioneers in the use of renewable energy and the minimization of greenhouse gas emissions.

This is a shining example of how innovative research and respectful treatment of nature can pave the way to a future worth living for all living beings on our planet.

Research at the site

- ***Field of Expertise Human & Biotechnology, TU Graz***
  https://www.tugraz.at/en/research/fields-of-expertise/human-biotechnology/overview-human-biotechnology/
- ***ACIB - Austrian Centre of Industrial Biotechnology***
  https://acib.at/
- ***Functional Diversity & Ecology, "Climate Change", University of Graz***
  https://climate-change.uni-graz.at/en/research-fields/functional-diversity-ecology/