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Orthogonal Redox Cofactor for Enhanced Biomanufacturing Flexibility

Tech ID: 34020 / UC Case 2024-997-0

BRIEF DESCRIPTION

Introducing a groundbreaking orthogonal redox cofactor, NMN+, to revolutionize redox reaction control in biomanufacturing.

FULL DESCRIPTION

This technology establishes nicotinamide mononucleotide (NMN+) as a noncanonical, orthogonal redox cofactor, alongside engineered enzymes, to precisely modulate redox reactions independent of natural metabolic pathways. This innovative approach enables the manipulation of NMNH:NMN+ ratios, facilitating the production of high-purity chemicals, such as stereo-pure 2,3-butanediol, in both cell-free systems and live E. coli cells, without interference from traditional redox systems.

SUGGESTED USES

- » Biomanufacturing of renewable chemicals and biofuels.
- » Production of stereo-pure pharmaceuticals and fine chemicals.
- » Development of cell-free synthetic biochemistry platforms.
- » Enhanced metabolic engineering for improved yield, titer, and productivity of bioproducts.
- » Customizable biocatalyst design for a wide range of industrial applications.

ADVANTAGES

- » Enables precise control of redox reaction directions, decoupled from natural metabolic processes.
- » Facilitates the production of high-purity, stereo-specific biochemicals.
- » Offers a cost-effective alternative to traditional cofactors with enhanced stability and efficiency.
- » Supports the development of orthogonal metabolic systems for improved biomanufacturing processes.
- » Potential to vastly expand the range of bio-manufacturable products through flexible, efficient redox control.

PATENT STATUS

Country	Type	Number	Dated	Case
Patent Cooperation Treaty	Published Application	2025/245512	11/27/2025	2024-997

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OTHER INFORMATION

CATEGORIZED AS

- » **Biotechnology**
 - » Industrial/ Energy
- » **Energy**
 - » Bioenergy
- » **Materials & Chemicals**
 - » Biological
 - » Chemicals
- » **Research Tools**
 - » Expression System
- » **Engineering**
 - » Other

RELATED CASES

2024-997-0

Additional Patent Pending

RELATED MATERIALS

» [Aspacio, D., et al. Li, H. \(2024\). Shifting redox reaction equilibria on demand using an orthogonal redox cofactor. Nat. Chem. Biol. 20.](#)

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