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SUSTAINABLE SPACE STATIONS: THE INTEGRATION OF BIOREACTORS AND ADAPTIVE LABORATORY EVOLUTION FOR SUCCINIC ACID PRODUCTION

Abstract

Succinic acid, a compound with four carbon atoms and two terminal carboxyl groups, plays a crucial role as a platform chemical in producing high-value molecules, bioplastics, and food industry products. Its production process often utilizes carbon-rich industrial waste, such as glycerol and CO2, with bacteria metabolically producing it under anaerobic conditions in the reductive branch of the tricarboxylic acid cycle. Despite various companies exploring biotechnological production methods, achieving cost parity with traditional petrochemical processes remains elusive. However, the significance of succinic acid is underscored by its 183 $million market volume in 2023. To address production challenges, Adaptive Laboratory Evolution (ALE) has b genetically modified microorganisms for more efficient succinic acid production. ALE-optimized bacteria have offered vit reactor, equipped with an electric field and anion-selective membrane, aimed at enhancing succinic acid production. Yuri's bio toxic and environmentally friendly production, integrated into a waste cycle, supports sustainable human expansion into spac