Synthesis of biobased adipic acid from lignin derivatives using engineered *Pseudomonas taiwanensis* VLB120

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Polyamides, with Nylons representing an 95% share thereof, are among the most important materials of the chemical industry [1]. Currently, monomers for the production of Nylons are gained from fossil feedstock. The long-known and still highly industrially relevant synthetic polymer Nylon6,6 is constituted by 50 mol% of the chemical building block adipic acid. As part of the increased global demand for using sustainable and biobased substrates for the establishment of a biobased economy, key building blocks like adipic acid, must be produced via processes that come with minimal emissions.

We investigate an electrochemical-microbial process line that utilizes depolymerized lignin as a starting material for producing adipic acid. Our previous work showed that the aromatic compounds in liquid fractions from lignin depolymerization can be electrochemically hydrogenated to their aliphatic counterparts [2]. By using microbial biotransformation, these aliphatic compounds are converted to adipic acid [2]. This was achieved using the bacterial production strain *Pseudomonas taiwanensis* VLB120 harbouring an enzymatic cascade for the production of adipic acid from cyclohexane that was established earlier by Bretschneider and coworkers [3].

To maximize product yield, conversion rates as well as to expand the portfolio of feedstock, the current work investigates the conversion of different hydrogenated monomers to adipic acid through microbial biotransformation. Therefore, resting cell assays with suspended cultures of *P taiwanensis* strains were performed. In addition to cyclohexanol, the hydrogenated monomers cis-1,2-cyclohexanediol, trans-1,2-cyclohexanediol and (1S,2S)-2-Methoxycyclohexanol were converted to adipic acid [4]. This broadening of the substrate spectrum will enable an efficient combination of the electrochemical and biological processes that is currently under investigation.

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[3] L. Bretschneider, I Heuschkel, K. Bühler, R. Karande, B. Bühler, *Metab Eng* **2022**; *70*, 206–17.

[4] L. Seibert, et al., in preparation.